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Site Environment Report for Calendar Year 2009

DOE Operations at The Boeing Company Santa Susana Field Laboratory Area IV

Site Environmental Report
for Calendar Year 2009
DOE Operations at

The Boeing Company
Santa Susana Field Laboratory, Area IV

Prepared by the Staff of

The Boeing Company
Santa Susana Field Laboratory

September 2010

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BOEING

CERTIFICATE OF ACCURACY

I certify that I have personally examined and am familiar with the information submitted herein and, based on inquiry of those individuals immediately responsible for preparing this report, I believe that the submitted information is true, accurate, and complete.

Phil Rutherford
Manager, Health, Safety & Radiation Services
The Boeing Company
Santa Susana Field Laboratory

September 8, 2010

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Department of Energy
Washington, DC 20585

September 8, 2010

Subject: 2009 Site Environmental Report for the Energy Technology Engineering Center (ETEC)

Dear Sir or Madam:

The Boeing Company has prepared the subject report for the U.S. Department of Energy (DOE). It is a comprehensive summary of the Department's environmental protection activities at ETEC in Canoga Park, California for Calendar Year 2009. Site Environmental reports are prepared annually for all DOE sites with significant environmental activities and distributed to external regulatory agencies, interested organizations, and individuals.

To the best of my knowledge, this report accurately summarizes the results of the 2009 environmental monitoring and restoration program at ETEC for DOE. This statement is based on reviews conducted by the Oakland Projects Office staff and by the staff of the Boeing Company.

A reader survey form is provided with this report to provide comments. Write directly to:

U.S. Department of Energy
Energy Technology Engineering Center
P.O. Box 10300
Canoga Park, CA 91309

Questions may also be directed to me at (818) 466-8959.

Sincerely,

Richard J. Schassburger
Federal Project Director
Oakland Projects Office

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ACKNOWLEDGMENT

Preparation of this report has been a collaborative effort of many members of Boeing's Environment, Health and Safety (EHS) Department.

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- The staff of the Boeing Creative Services group provided publication assistance. The staff of Haley & Aldrich, Inc. and MWH Global, Inc. provided technical contribution for this report.

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1. EXECUTIVE SUMMARY

This Annual Site Environmental Report (ASER) for 2009 describes the environmental conditions related to work performed for the Department of Energy (DOE) at Area IV of Boeing's Santa Susana Field Laboratory (SSFL). The Energy Technology Engineering Center (ETEC), a government-owned, company-operated test facility, was located in Area IV. The operations in Area IV included development, fabrication, and disassembly of nuclear reactors, reactor fuel, and other radioactive materials. Other activities in the area involved the operation of large-scale liquid metal facilities that were used for testing non-nuclear liquid metal fast breeder reactor components. All nuclear work was terminated in 1988, and all subsequent radiological work has been directed toward decontamination and decommissioning (D&D) of the former nuclear facilities and their associated sites. Liquid metal research and development ended in 2002. Since May 2007, the D&D operations in Area IV have been suspended by the DOE, but the environmental monitoring and characterization programs have continued.

Results of the radiological monitoring program for the calendar year 2009 continue to indicate that there are no significant releases of radioactive material from Area IV of SSFL. All potential exposure pathways are sampled and/or monitored, including air, soil, surface water, groundwater, direct radiation, transfer of property (land, structures, waste), and recycling.

Due to the suspension of D&D activities in Area IV, no effluents were released into the atmosphere during 2009. Therefore, the potential radiation dose to the general public through airborne release was zero. Similarly, the radiation dose to a member of the public (maximally exposed individual) due to direct radiation from SSFL is indistinguishable from background.

All radioactive wastes are processed for disposal at DOE disposal sites and/or other licensed sites approved by DOE for radioactive waste disposal. No liquid radioactive wastes were released into the environment in 2009.

During 2009, ten regulatory agency inspections, audits, and visits were conducted in Area IV. These inspections and visits were carried out by the California Department of Public Health, Radiologic Health Branch (DPH/RHB), the Cal-EPA Department of Toxic Substances Control (DTSC), and Ventura County Air Pollution Control District (VCAPCD).

In summary, this Annual Site Environmental Report provides information to show that there are no indications of any potential impact on public health and safety due to the DOE-sponsored operations conducted at Area IV of SSFL. The report summarizes the environmental and effluent monitoring results for the responsible regulatory oversight agencies.

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2. INTRODUCTION

This annual report describes the environmental monitoring programs related to the Department of Energy's (DOE) activities at the Santa Susana Field Laboratory (SSFL) facility located in Ventura County, California during 2009. Part of the SSFL facility, known as Area IV, had been used for DOE's activities since the 1950s. A broad range of energy related research and development (R&D) projects, including nuclear technology projects, was conducted at the site. All the nuclear R&D operations in Area IV ceased in 1988, and the efforts were directed toward decontamination and decommissioning (D&D). By 2007, all that remained to be completed were the D&D of two former nuclear facilities and removal of two liquid metal facilities. In May 2007, the D&D operations in Area IV were suspended until DOE completes the SSFL Area IV Environmental Impact Statement (EIS). The environmental monitoring and characterization programs were continued throughout 2009.

As required by DOE Order 231.1A, "*Environment, Safety and Health Reporting*," this report is used to communicate internally to DOE and externally to the public the environmental monitoring results and the state of environmental conditions related to DOE activities at SSFL. The report summarizes:

- Environmental management performance for DOE activities (e.g., environmental monitoring of effluents and estimated radiological doses to the public from releases of radioactive materials)
- Environmental occurrences and responses reported during the calendar year
- Compliance with environmental standards and requirements
- Significant programs and efforts related to environmental management.

2.1 SITE LOCATION AND SETTING

The SSFL site occupies 2,850 acres located in the Simi Hills of Ventura County, California, approximately 48 km (30 miles) northwest of downtown Los Angeles. The SSFL is situated on rugged terrain with elevations at the site varying from 500 to 700 m (1,650 to 2,250 ft) above sea level (ASL). The location of the SSFL site in relation to nearby communities is shown in Figure 2-1. No significant agricultural land use exists within 30 km (19 miles) of the SSFL site. Undeveloped land surrounds most of the SSFL site.

The site consists of four administrative areas and undeveloped land. Figure 2-2 illustrates the arrangement of the site. Area IV has an area of about 290 acres. Boeing and DOE-operated facilities (Figures 2-3 and 2-4) share the Area IV portion of this site. While the land immediately surrounding Area IV is undeveloped, suburban residential areas are at greater distances. The community of Santa Susana Knolls lies 4.8 km (3.0 miles) to the northeast, the Bell Canyon area begins approximately 2.3 km (1.4 miles) to the southeast, and the Brandeis-Bardin Institute is adjacent to the north. Except for the Pacific Ocean, which is approximately 20 km (12 miles) south, no recreational body of water of noteworthy size is located in the surrounding area. Four major reservoirs providing domestic water to the greater Los Angeles area are located within 50 km (30 miles) of SSFL; the closest one to SSFL (Bard Reservoir, near the west end of Simi Valley) is more than 10 km (6 miles) from Area IV.

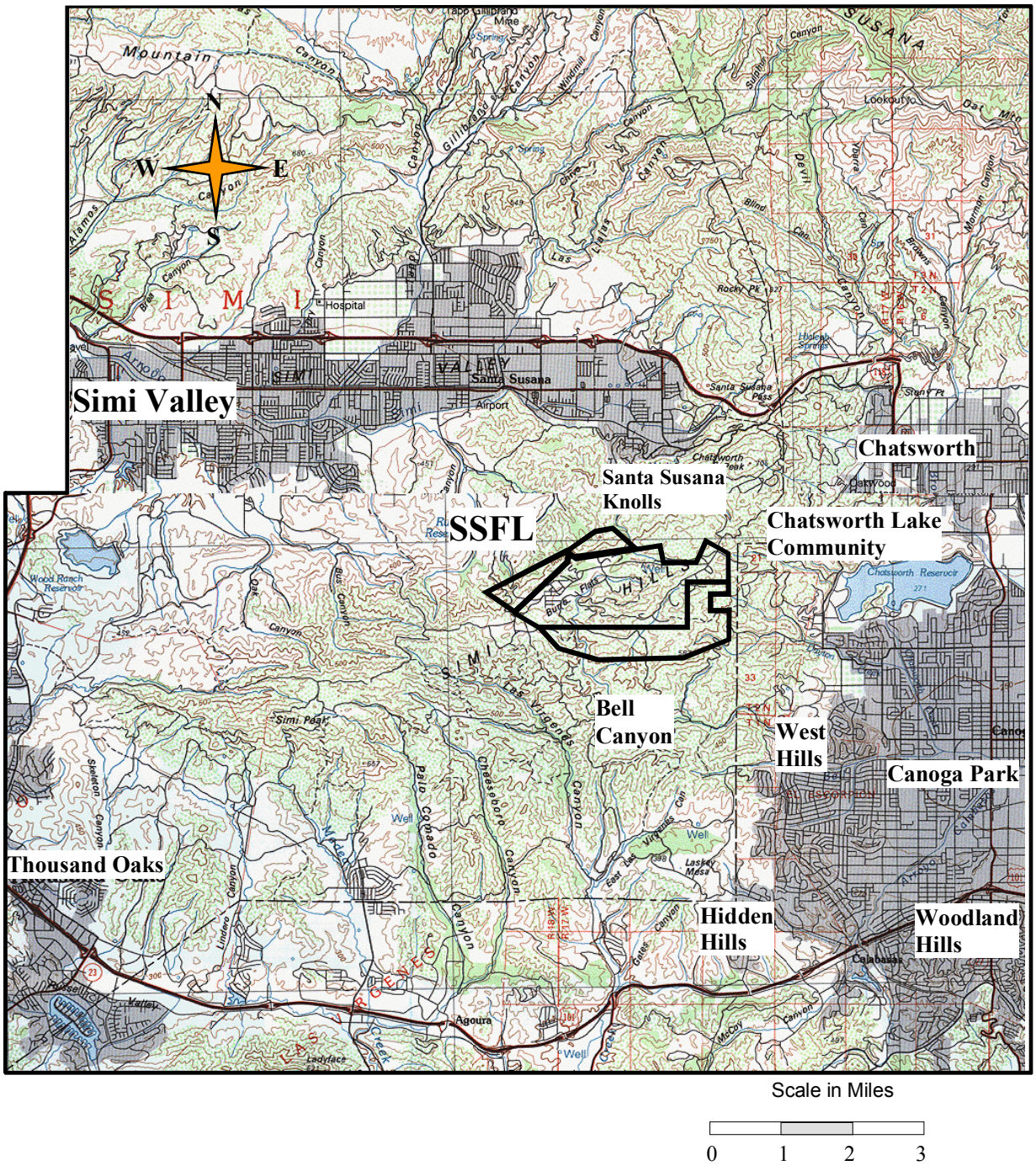

Figure 2-1. Map Showing Location of SSFL

Subdivisions			
Owner	**Jurisdiction**	**Acres**	**Subtotals**
Boeing	Boeing--Area IV Boeing—Area I and III Boeing (Undeveloped land)	289.9 784.8 1,324.6	 2,399.3
Government	NASA (former AFP 57) NASA (former AFP 64)	409.5 41.7	 451.2
Total Acres			2,850.5

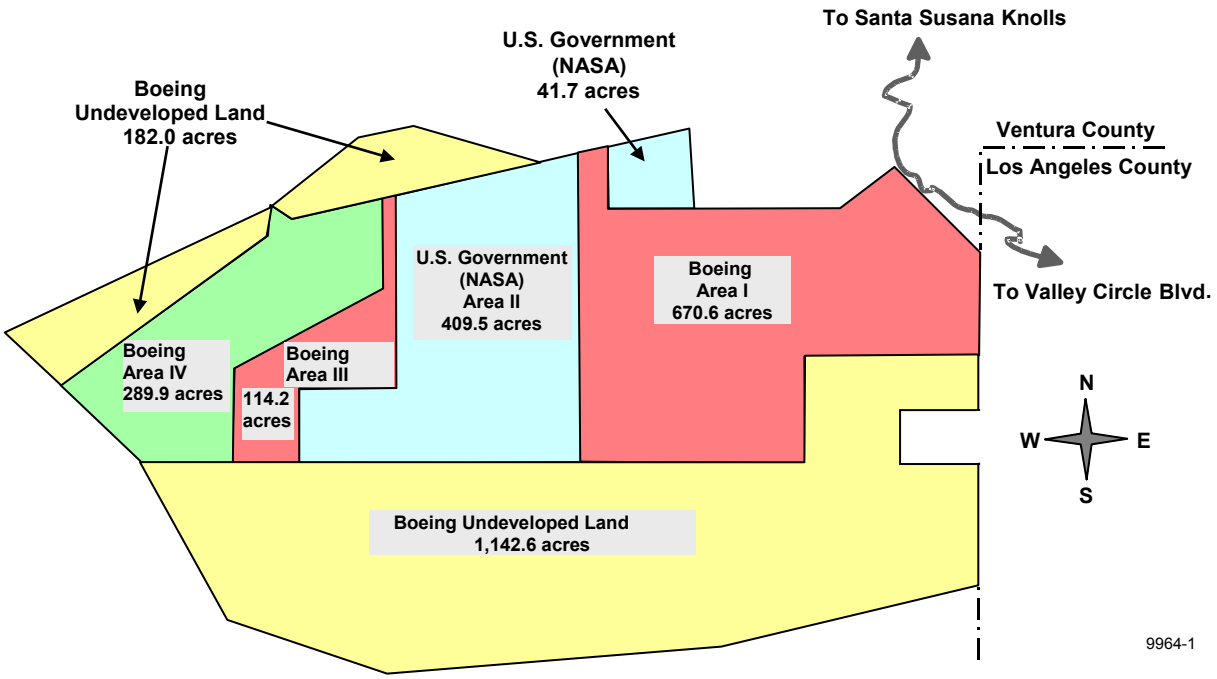

Figure 2-2. Santa Susana Field Laboratory Site Arrangement

2.2 OPERATIONAL HISTORY

The SSFL has been used for various research, development, and test projects funded by several U.S. government agencies, including DOE, Department of Defense (DOD), and National Aeronautics and Space Administration (NASA). Since 1956, various R&D projects had been conducted in Area IV, including small tests and demonstrations of reactors and critical assemblies, fabrication of reactor fuel elements, and disassembly and declading of used fuel elements. These projects were completed and terminated in the course of the next 30 years. Details about these projects can be found in the DOE website devoted to the Energy Technology Engineering Center (ETEC) closure (http://www.etec.energy.gov).

All the nuclear R&D operations in Area IV ceased in 1988. The only work related to the nuclear operations after 1988 was the cleanup and decontamination of the remaining inactive radiological facilities and the off-site disposal of radioactive waste. In 1998, DOE awarded Boeing a contract for the closure of all DOE facilities in Area IV. Boeing performs the environmental remediation and restoration activities at SSFL for the DOE. In May 2007, the D&D activities in Area IV were suspended by the DOE, pending completion of an Environmental Impact Statement (EIS).

2.3 FACILITY DESCRIPTIONS

There were 27 radiological facilities that operated in Area IV (See Figure 2-4). As of the end of 2009, twenty of them have been released for unrestricted use, four have been declared suitable for unrestricted release by DOE, and one (the Building 4059 site) is pending release for unrestricted use. Six radiological facilities have been declared free of contamination; they are 4009, 4100, 4019, 4055, 4011 and 4029. Demolition is pending for two facilities, Building 4024 and the RMHF.

In addition to radiological facilities, two sodium and related liquid metal test facilities remain in Area IV. They are the Sodium Pump Test Facility (SPTF) and the Hazardous Waste Management Facility (HWMF). These were constructed at SSFL to support development testing of components for liquid metal electrical power production systems. The facilities are no longer needed, and the objective is to dismantle the structural steel, concrete and utilities, and restore the land to previous conditions.

2.3.1 Radiological Facilities

Radioactive Materials Handling Facility (RMHF)

The RMHF complex consists of Buildings 4021, 4022, 4034, 4044, 4075, 4563, 4621, 4658, 4665 and 4688. Sump 4614 was a holdup pond located at the base of the drainage channel west of the RMHF complex. The use of the pond was discontinued, and the pond was excavated in 2006. The drainage channel and pond have been replaced with an above ground storage tank, and the tank receives storm water runoff from the RMHF via a drainage pipe.

Operations at RMHF included processing, packaging, and temporary storage of radioactive waste materials for offsite disposal at DOE approved facilities. The radioactive waste included uranium, plutonium, mixed fission products such as cesium-137 (Cs-137) and strontium-90 (Sr-90), and activation products such as cobalt-60 (Co-60), europium-152 (Eu-152), and tritium (H-3).

Since May 2007, the D&D operations at the RMHF have been suspended. In 2009, no effluents were released into the atmosphere through the stack at the RMHF, and no radioactive liquid effluents were released from the facility.

Figure 2-3. Santa Susana Field Laboratory Site, Area IV

Figure 2-4. Map of Prior and Current Radiological Facilities in Area IV

Building 4024

Building 4024 housed four experimental reactor systems in the 1960s. Following termination of the experimental projects, all equipment and fuel were removed from the facility. The shielding concrete in the vaults has low levels of activation products including cobalt-60 and europium-152. Remediation of the building started in 2004: the portions of the building used to support the office space and the mechanical ventilation systems were demolished, the ventilation stack was removed, and a geophysical study supporting final building demolition was completed. Most of the demolished structure was sent to Kettleman Hills following certification as decommissioned material by the California Department of Public Health (DPH). In 2007, demolition of the building was put on hold by the DOE.

Building 4059

Building 4059 is the former Systems for Nuclear Auxiliary Power (SNAP) reactor ground test facility. The demolition of the entire building was completed in 2004, and building debris was shipped to either the Nevada Test Site (radioactive waste) or Kettleman Hills

(decommissioned material). In 2005, site backfill was completed, and the final status MARSSIM survey was completed (Boeing, 2006). Both DPH and ORISE have completed their verification surveys at the Building 4059 site. Currently, the site is pending release for unrestricted use.

2.3.2 Former Sodium Facilities

Sodium Pump Test Facility (SPTF)

Activities at the SPTF, which consists of buildings 4461, 4462 and 4463, were confined to facility demolition. As part of these activities, a portion of the final test article was removed and returned to the test requester. All utility connections to the buildings were severed. Demolition of building 4461 was completed in 2007.

In May 2007, DOE halted demolition of the SPTF, and the facility was placed into a safe shutdown condition.

Hazardous Waste Management Facility (HWMF)

The Hazardous Waste Management Facility, a permitted facility consisting of buildings 4133 and 4029 was approved for closure and demolition by the DTSC in 2007. In May 2007, DOE halted plans for demolition. This facility was placed into a safe shutdown mode.

2.4 ASER CONTENTS

This ASER provides the following information related to ensuring protection of human health and the environment for DOE's operations at Area IV:

- Section 3 "Compliance Summary", identifies and provides status for applicable permits and other regulatory requirements for DOE's closure mission.
- Section 4 "Environmental Program Information" summarizes the DOE and Boeing programs that are in place to institutionalize the identification, monitoring and response to known or potential releases to the environment that may pose a threat to human health and the environment.
- Section 5 "Environmental Radiological Monitoring" summarizes the data collection activities and associated results for radiological contaminants.
- Section 6 "Environmental Non-Radiological Monitoring" summarizes the data collection activities and associated result for non-radiological contaminants.
- Section 7 "Environmental Monitoring Program Quality Control" summarizes the quality assurance/quality control elements incorporated into the Boeing data analysis program.

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3. COMPLIANCE SUMMARY

This section summarizes Boeing's compliance with federal, state, and local environmental regulations. Two main categories are presented: Section 3.1 discusses compliance status, and Section 3.2 discusses current issues and actions.

3.1 COMPLIANCE STATUS

During 2009, ten regulatory agency inspections, audits, and visits were conducted in Area IV. These inspections and visits were carried out by the California Department of Public Health, the Cal-EPA Department of Toxic Substances Control (DTSC), and Ventura County Air Pollution Control District (VCAPCD).

A list of inspections, audits, and site visits by the various agencies overseeing the SSFL sites is given in Table 3-1.

Table 3-1. 2009 Agency Inspections/Visits Related to DOE Operations

Date (2009)	Agency	Subject Area	Results
January	State of CA, DPH	Quarterly Environmental TLD Exchange	Compliant
April	State of CA, DPH	Quarterly Environmental TLD Exchange	Compliant
July	State of CA, DPH	Quarterly Environmental TLD Exchange	Compliant
September	VCAPCD	Annual Inspection of Permit to Operate No. 00271 (for DOE operations in Area IV)	Compliant
September	Cal EPA-DTSC	Discussion of Biological Survey	Compliant
September	Cal EPA-DTSC	Review of the NPDES Quarterly Reports and SWPPP (including Outfalls 3-7 in Area IV)	Compliant
October	State of CA, DPH	Quarterly Environmental TLD Exchange	Compliant
November	Cal EPA-DTSC	Tour of SSFL; Discussion of Health Related Issues	Compliant
December	Cal EPA-DTSC	Field Inspection of Areas of Cultural Significance in Area IV, SSFL	Compliant
December	Cal EPA-DTSC	Tour of Area IV SSFL; Discussion of Plans to Perform a Cultural Resources Survey and Management of Resources while EPA Conducts Its Radiological Survey	Compliant

3.1.1 Radiological

The radiological monitoring programs at the SSFL comply with the applicable federal, state, and local environmental regulations. The monitoring results indicate that the SSFL does not pose any significant radiological impact on the health and safety of the general public. All potential pathways, as illustrated in Figure 3-1, are monitored. These include airborne, direct exposure, groundwater, surface water, waste disposal, and recycling.

3.1.1.1 Airborne Activity

Due to the suspension of all DOE's Decontamination and Decommissioning (D&D) operations at SSFL, no effluents from the RMHF stack were released into the atmosphere in 2009. As a result, the potential radiation exposure dose from the airborne release was zero.

For the airborne releases from the RMHF exhaust stack, the maximum radiation exposure dose to an offsite individual is limited at 10 mrem/yr, as specified in 40 CFR 61, the National Emission Standards for Hazardous Pollutants (NESHAPs), Subpart H (DOE facilities).

3.1.1.2 Groundwater

There are 10 DOE-sponsored near-surface groundwater wells and 49 DOE-sponsored Chatsworth Formation wells in and around Area IV. Groundwater is sampled and analyzed periodically for radiological constituents, which include gross alpha, gross beta, tritium (H-3), potassium-40 (K-40), strontium-90 (Sr-90), isotopic uranium, and man-made beta/gamma emitters. Both 2009 and all historical analytical results are presented in the 2009 Annual Groundwater Report:
http://www.etec.energy.gov/Cleanup/Groundwater_Monitoring.html

3.1.1.3 Surface Water

Surface water is regulated under the Los Angeles Regional Water Quality Control Board (LA RWQCB) National Pollutant Discharge Elimination System (NPDES). The existing NPDES Permit (CA0001309) for SSFL was revised on May 19, 2009 and became effective on June 29, 2009. The NPDES permit allows the discharge of storm water runoff, treated groundwater and fire suppression water into Bell Creek, a tributary to the Los Angeles River. The permit also regulates the discharge of storm water runoff from the northwest slope (Area IV) locations into the Arroyo Simi, a tributary of Calleguas Creek. Discharge along the northwest slope (RMHF: Outfall 003, SRE: Outfall 004, FSDF #1: Outfall 005, FSDF #2: Outfall 006, and Building 4100: Outfall 007) generally occurs only during and immediately after periods of heavy rainfall. The permit applies the numerical limits for radioactivity established for drinking water supplies to discharges through these outfalls. The permit requires radiological measurements of gross alpha, gross beta, tritium, strontium-90, total combined radium-226 and radium-228, potasium-40,

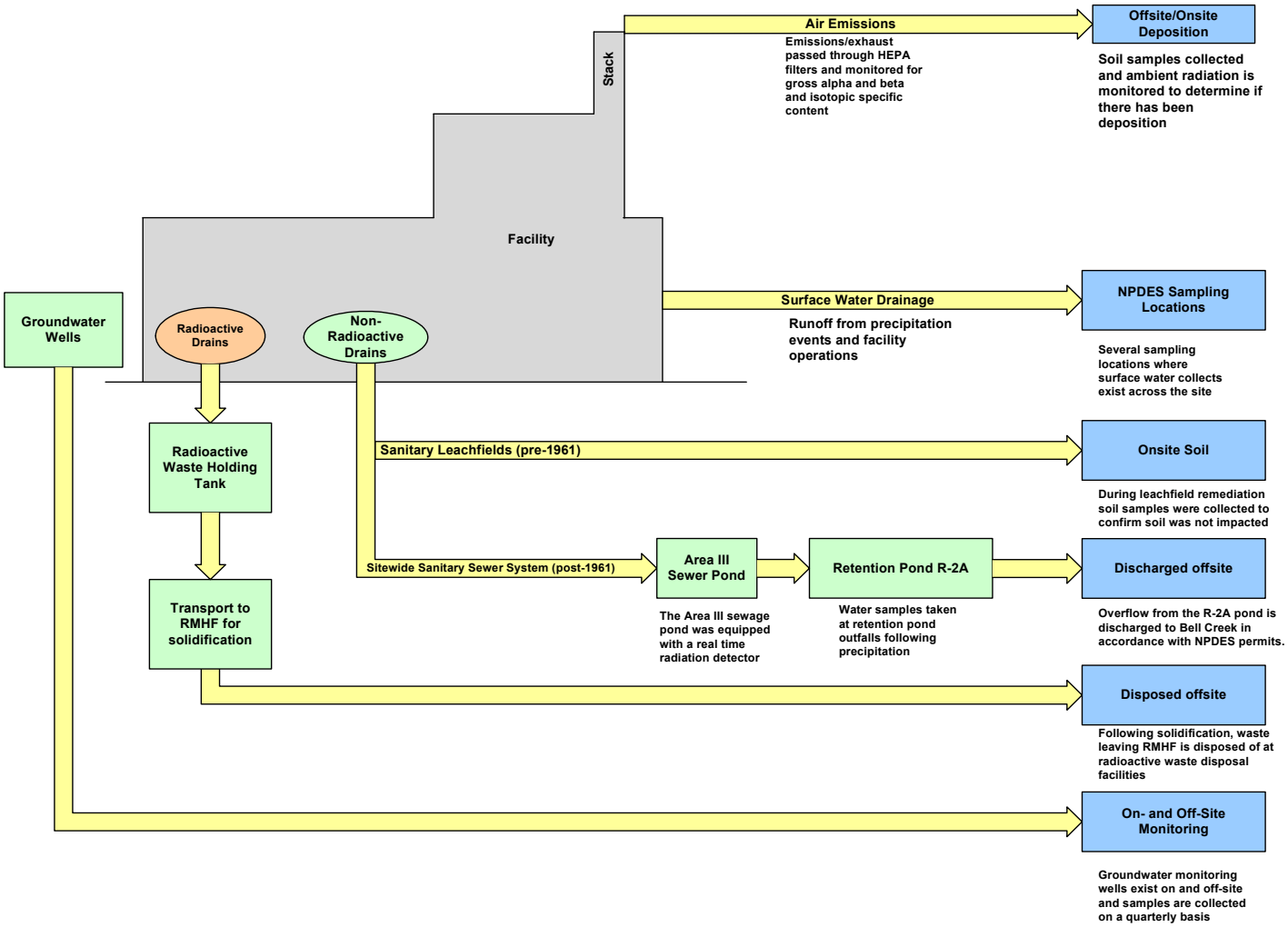

Figure 3-1. Conceptual Model of Potential Pathways

cesium-137 and uranium isotopes. Detailed monitoring results are provided in the 2009 Annual NPDES Discharge Monitoring Report (Boeing, 2010). The report may also be viewed at:
http://www.boeing.com/aboutus/environment/santa_susana/ents/monitoring_reports.html

3.1.1.4 Direct Radiation

The external exposure rate at Boeing SSFL's northern property boundary, the closest property boundary to the RMHF, was indistinguishable from natural background. This property line is approximately 300 meters from the RMHF and separated by a sandstone ridge, effectively shielding the boundary from any direct radiation from the RMHF. Dosimeters placed on the RMHF side of this sandstone ridge, approximately 150 meters from the RMHF, read an average of 9.7 mrem/year above local background. This is considerably below DOE's 100 mrem/year limit.

3.1.1.5 Protection of Biota

There is no aquatic system in the Area IV of SSFL. Storm water discharge from the site is monitored in accordance with the NPDES permit (see Section 3.1.1.3 above).

The terrestrial biota, i.e., vegetation and small wild animals, are abundant at SSFL. They are subject to potential exposure to the radioactivity in soil. Screening analysis indicates that the potential radiation exposure is less than the dose limit recommended by the DOE. Section 5.4 provides detailed information on biota protection.

3.1.2 Chemical

3.1.2.1 Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA) gives the Environmental Protection Agency (EPA) broad authority to regulate the handling, treatment, storage, and disposal of hazardous wastes. This authority has been delegated to the California EPA and DTSC. DOE owns and co-operates two RCRA-permitted Treatment, Storage, and Disposal Facilities within ETEC. Permit numbers are listed in Section 3.1.3.

Radioactive Materials Handling Facility (RMHF)

In 2009, the RMHF continued to be permitted as an Interim Status (Part A) facility. This facility is used primarily for the handling and packaging of low-level radioactive and mixed wastes. Interim status is required for the storage and treatment of the small quantities of mixed waste (waste containing both hazardous and radioactive constituents) resulting from D&D activities at ETEC. The final disposition of mixed waste is addressed under the DOE and DTSC-approved Site Treatment Plan, which is authorized by the Federal Facilities Compliance Act (FFCAct). The RMHF is in a non-operational, safe shutdown mode since May 2007.

Hazardous Waste Management Facility (HWMF)

The Hazardous Waste Management Facility (HWMF) includes an inactive storage facility (Bldg 4029) and an inactive treatment facility (Bldg 4133) that was utilized for reactive metal waste such as sodium. The facility is no longer in operation and is awaiting final closure.

RCRA Facility Investigation

Under the Hazardous and Solid Waste Amendments of 1984, RCRA facilities can be brought into the corrective action process when an agency is considering any RCRA permit action for the facility. The SSFL was initially made subject to the corrective action process in 1989 by EPA, Region IX. The EPA has completed the Preliminary Assessment Report and the Visual Site Inspection portions of the RCRA Facility Assessment (RFA) process. ETEC is now within the RCRA Facility Investigation (RFI) stage of the RCRA corrective action process.

The DTSC has RCRA authorization and has become the lead agency in implementing the RCRA corrective action process for the SSFL, including ETEC. ETEC has performed soil sampling at various solid waste management units (SWMUs) and areas of concern (AOCs) that were identified in the RFI Work Plan.

The current conditions report and a draft of the RFI Work Plan for the Area IV SWMUs were submitted to the DTSC in October 1993. In November 1996, DTSC approved a revised work plan addendum. During 2000, an amendment to the 1996 RFI Work Plan was submitted to and approved by DTSC. This amendment added two DOE sites to the RCRA RFI program. Fieldwork in areas of unrestricted use began in November 1996.

During 2009, 14 soil matrix, 55 near-surface groundwater, and 21 spring/seep samples were collected within or near Area IV. Samples collected and analyses performed to date at DOE locations are summarized in Section 6 (Table 6-3). Data review and validation were completed in 2009.

Groundwater

Characterization of the groundwater at the site continues. Six distinct areas of TCE-impacted groundwater have been delineated inside the northwestern property boundary of Area IV, as shown in the shaded areas in Figure 6-3. In 2009, high concentrations of TCE continued to be detected in three of these areas. TCE was not detected in the fourth area, and the other two areas were not monitored in 2009. Detailed TCE results are provided in Section 6.3.

3.1.2.2 Federal Facilities Compliance Act

Boeing manages DOE's RCRA mixed wastes in accordance with FFCAct-mandated Site Treatment Plan (STP) approved in October 1995. All mixed wastes that require extended on-site storage are managed within the framework of the STP. Characterization, treatment, and disposal plans for each of several different waste streams are defined in the STP with enforceable milestones. Management of the mixed wastes has been in full compliance with the STP. In 2009, there was no mixed wastes in the inventory, and DTSC has agreed that no update on inventory and status of mixed wastes was necessary for 2009.

3.1.2.3 National Environmental Policy Act

The National Environmental Policy Act (NEPA) establishes a national policy to ensure that consideration is given to environmental factors in federal planning and decision-making. For those projects or actions expected to either affect the quality of the human environment or create controversy on environmental grounds, DOE requires that appropriate NEPA actions (Categorical Exclusion [CX], Environmental Assessment [EA], Finding of No Significant Impact [FONSI], or Notice of Intent [NOI], draft Environmental Impact Statement [EIS], final EIS, Record of Decision [ROD]) have been incorporated into project planning documents. DOE has implemented NEPA as defined in Federal Register Volume 57, Number 80, pages 15122 through 15199 and in accordance with the DOE Order 451.1B.

The DOE issued a Finding of No Significant Impact and the final EA report on March 31, 2003. Subsequently, the Natural Resources Defense Council, City of Los Angeles, and the Committee to Bridge the Gap filed a lawsuit in federal court, claiming DOE had violated NEPA, CERCLA and the ESA. Pursuant to a court order, an EIS is being prepared to comply with NEPA. More details about the EIS are provided in Section 3.2, Current Issues and Actions.

3.1.2.4 Clean Air Act

The original 1970 Clean Air Act (CAA) authorized the Federal EPA to establish National Ambient Air Quality Standards (NAAQS) to limit the levels of pollutants in the air. EPA has promulgated NAAQS for six criteria pollutants: sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and particulate matter. All areas of the United States must maintain ambient levels of these pollutants below the ceilings established by the NAAQS; any area that does not meet these standards is considered a "non-attainment" area (NAA). Under this law, states are required to develop state implementation plans (SIPs) that explain how each state will carry out its responsibilities under the CAA. However, the EPA must approve each SIP, and it may enforce the CAA itself if it deems a state's SIP unacceptable. Other requirements include National Emissions Standards for Hazardous Air Pollutants (NESHAPs), New Source Performance Standards (NSPSs), and monitoring programs established to achieve air quality levels beneficial to the public health and environment.

Area IV of the SSFL is regulated by the Ventura County Air Pollution Control District (VCAPCD) and must comply with all applicable rules, regulations, and permit conditions. DOE previously operated under Permit to Operate No.00271. In 2008, this Permit was consolidated with the existing permit No. 00232. As a result, DOE currently operates under Permit to Operate No. 00232. The VCAPCD performed its annual inspection of Area IV on March 25, 2009. No violations or compliance issues were identified.

3.1.2.5 Clean Water Act

The Clean Water Act (CWA) is the primary authority for water pollution control programs, including the National Pollutant Discharge Elimination System (NPDES) permit program. The NPDES program regulates point source discharges of surface water and the discharge of storm water runoff associated with industrial activities.

Surface water discharges from SSFL are regulated under the California Water Code (Division 7) as administered by the Los Angeles Regional Water Quality Control Board (LARWQCB). The existing NPDES Permit (CA0001309) for SSFL was revised on May 19, 2009 and became effective on June 29, 2009. The 2009 NPDES Permit incorporated the General Permit (No. CAS000001) for storm water, which includes the requirement for a site-wide Storm Water Pollution Prevention Plan (SWPPP). The SWPPP is revised as needed and includes by reference many existing pollution prevention plans, policies, and procedures implemented at the SSFL site. Several key elements of the plan, including maps, are continually updated. Another key element is the Boeing procedure "SSFL Storm Water Pollution Prevention Requirements." The Spill Prevention Control and Countermeasure (SPCC) plan serves to identify specific procedures for handling oil and hazardous substances to prevent uncontrolled discharge into or upon the navigable waters of the State of California or the United States. The U.S. EPA requires the preparation of an SPCC plan by those facilities that, because of their locations, could reasonably be expected to discharge oil in harmful quantities into or upon navigable waters. A revised SPCC plan was submitted as a part of the revised Hazardous Materials Release Response Business Plan to the County of Ventura Environmental Health Division on February 26, 2010.

3.1.3 Permits and Licenses (Area IV)

Listed below are the permits and licenses applicable to activities in Area IV.

Permit/License	Facility	Valid
Air (VCAPCD)		
Permit 00232	Combined permit renewed	Current
Ventura County		
Grading Permit 9225/CUP 02488	Soil Borrow Area	Current and in process to close.
Treatment Storage (EPA)		
CAD000629972 (93-3-TS-002)	Hazardous Waste Management Facility (T133 and T029)	Inactive. The closure plan was approved on 12/22/06, but demolition has been suspended based on the DOE stop work order and DTSC directions.
CA3890090001	Radioactive Materials Handling Facility (RMHF)	Draft closure plan submitted in 2007.
NPDES (LARWQCB)		
CA0001309	Santa Susana Field Laboratory	Effective on 12/21/2007. Current revision effective on 6/29/2009.
State of California		
Radioactive Materials License (0015-19)	All Boeing SSFL facilities	Amendment 110 Issued on 1/4/07
Storm Water Pollution Prevention Plan 56C312650	Area IV	Current

3.2 CURRENT ISSUES AND ACTIONS

3.2.1 Area IV Environmental Impact Statement

Pursuant to a federal court order issued in May 2007, the DOE is preparing an Environmental Impact Statement (EIS) for Area IV. Activities conducted in support of this EIS during 2009-10 are described below.

In February 2009, DOE published the results of interviews with 59 community stakeholders.

http://www.etec.energy.gov/EIS/Documents/EIS_Public_Participation_Draft_Preliminary_Recommendations.pdf

http://www.etec.energy.gov/EIS/Documents/EIS_Community_Interviews.pdf

In August 2009, DOE published the Area IV EIS Community Involvement Plan.

http://www.etec.energy.gov/EIS/Documents/Area_IV_Community_Involvement_Plan.pdf

In September 2009, DOE published responses to the EIS Scoping Comments received as a result of the EIS Scoping Public Meetings held in July 2008.

http://www.etec.energy.gov/EIS/Documents/SSFL%20Area%20IV%20Final%20Scoping%20CRD.pdf

In December 2009, DOE published a Biological Survey Report.

http://www.etec.energy.gov/library/Biological_Survey/Fall_2009_Area_IV_Bio_Survey_Report.pdf

In February 2010, DOE published a draft Cultural Resources Survey Plan.

http://www.etec.energy.gov/library/Cultural_Resources/Draft_Cultural_Resources_Study_Plan_November_2009.pdf

In March 2010, DOE published the final Community Involvement Plan and an Annual Community Involvement Report for 2009.

http://www.etec.energy.gov/EIS/Documents/SSFL_Area_IV_Community_Involvement_Plan_2-26-10.pdf

http://www.etec.energy.gov/EIS/Documents/Annual%20Report%202009.pdf

As part of the Community Involvement Plan, DOE has invited past employees to participate in voluntary interviews, so that they could describe past practices at AEC and DOE funded operations at Area IV of SSFL.

3.2.2 Radiological Decommissioning and Decontamination

Since May 24, 2007, the decommissioning and decontamination of the remaining DOE facilities in Area IV is on hold following the federal court order to conduct an EIS.

3.2.2.1 Radioactive Materials Handling Facility

The status of the D&D of the Radioactive Materials Handling Facility (RMHF) may be found at:
http://www.etec.energy.gov/History/Major-Operations/Support-Ops/RMHF-History.html

http://www.etec.energy.gov/Reading-Room/Project-Updates/RHMFEECA.html

Rainwater infiltrated into the Building 4022 vaults and sumps during the 2009-2010 rain season and was found to have low levels of cesium-137 and strontium-90 as a result of interaction with the vault floors. This water is currently stored in tanks and will be stabilized and solidified prior to disposing as LLRW at the Nevada Test Site.

3.2.2.2 SNAP Environmental Test Facility

In January 2007, AREVA initiated a characterization survey of the SNAP Environmental Test Facility (Building 4024) and began preparations for the demolition of the building and foundations. The characterization survey was documented in January 2008.

http://www.etec.energy.gov/library/4024_Characterization/SETF_Char_Report_finalr_010908%20_2_.pdf

The status of the D&D of the SNAP Environmental Test Facility (Building 4024) may be found at,

http://www.etec.energy.gov/History/Major-Operations/SNAP-Environmental-Test-Facility.html

http://www.etec.energy.gov/Reading-Room/Project-Updates/Building24EECA.html

Groundwater that infiltrates into the cells and French drain of Building 4024 is routinely pumped out into Baker tanks. This water is sampled for radionuclides prior to being shipped off-site as non-hazardous waste water. No nuclear by-product materials have been detected in this groundwater.

3.2.3 Disposal and Recycling of Non-radiological Waste

In 2009, soil from various Area IV NPDES outfalls was surveyed and sampled for radioactivity and classified as "decommissioned material" as best management practice and sent to the Kettleman Hills Class I hazardous waste disposal facility, in compliance with the Governor's Moratorium of 2002. In 2009, no metal from DOE radiological facilities was recycled. Miscellaneous debris collected from Area IV was surveyed for radiation. No radiological contamination was detected and the debris was sent to the Kettleman Hills Class I hazardous waste disposal facility.

3.2.4 SSFL Consent Order

In the first half of 2009, DTSC and the three responsible parties, DOE, NASA and Boeing conducted negotiations in an attempt to revise the previously signed SSFL Consent Order (August 2007) in order to incorporate the requirements of SB 990 (CA Legislative, 2007). These additional requirements included, among others:

- Historical Site Assessment for the management and use of radioactive materials in Area I, II and III

- Work-plan for a radiological survey of Area I, II and III
- Conduct of a radiological survey of Area I, II and III
- Conceptual site model for radionuclides in Areas I, II, III and IV
- Site wide risk assessment methodology for chemicals and radionuclides using the new SB 990 rural residential (agricultural) preliminary remediation goals
- Provision of database of all key documents related to the use and management of radioactive materials in Areas I, II, III and IV

The parties failed to reach agreement on a revised Consent Order and Boeing subsequently challenged SB 990 in federal court. This lawsuit is currently pending. The DOE and U.S. Department of Justice are currently in negotiations with CalEPA and the California Attorney General's Office.

3.2.5 EPA Radiological Background Study and Survey of Area IV

In July 2008, the DOE and EPA signed an inter-agency agreement, making available $1.5M for the EPA to conduct a radionuclide background study. Subsequently, the EPA published a "statement of work" describing the scope of this work and hosted a public meeting on December 11, 2008.

In April 2009, DOE and EPA signed a second interagency agreement, making available $38.3M for the EPA to conduct "Radiological Characterization of Area IV at SSFL." EPA has conducted numerous planning and status meetings with DOE, Boeing, community members and other stakeholders to plan these studies.

In August 2009, Boeing and DOE provided EPA with historical documents in response to a CERCLA 104(e) document request to support an Area IV Historical Site Assessment (HSA).

In March 2010, Boeing and EPA signed an Administrative Order of Consent (AOC), that describes the access agreement and requirements for EPA and its contractors to conduct work in Area IV.

Thus far, EPA has prepared work plans for radionuclide background sampling, Area IV gamma surveys, and Area IV groundwater, surface water, springs/seeps and sediment sampling. Field work for the radionuclide background study has been completed. EPA initiated publication of HSA technical memos in April 2010. EPA initiated the gamma survey and groundwater sampling of Area IV in July 2010.

This initial planning steps for these projects are described at,
http://www.etec.energy.gov/Health-and-Safety/EPA_Rad_Survey.html.

All work plans, schedules, meeting materials, status reports, etc. may be found on the EPA website at,
http://www.epa.gov/region09/santasusana.

3.2.6 DOE CleanUpdate

DOE has initiated quarterly newsletters called "CleanUpdate" to provide stakeholders with an update on its activities on the ETEC Closure Project. In 2009, three CleanUpdates were published in April, August and November. In 2010, two CleanUpdates have so far been published in March and June.

These CleanUpdates may be found at,
http://www.etec.energy.gov/Cleanup/Cleanup-Status.html

3.2.7 Sodium Reactor Experiment

In July 1959, the Sodium Reactor Experiment (SRE) experienced a coolant blockage, resulting in partial melting of fuel elements. The public is divided over the severity of the accident, from "worst nuclear accident in U.S. history" to minimal impact. In response, DOE hosted an informational workshop on August 29, 2009 designed to explore the diverse expert and community perspectives on what occurred prior to, during, and immediately after the accident.

The workshop began with presentations from three independent experts: Dr. Paul Pickard of Sandia National Laboratories, Dr. Thomas Cochran of the Natural Resources Defense Council, and Dr. Richard Denning of Ohio State University. Over 185 workshop attendees then had an opportunity to ask questions of these experts. Finally, community members had an opportunity to provide their own perspectives on what occurred.

Presentation material, poster board and handout material, and videos of the presentations and Q&A sessions are online at,

http://www.etec.energy.gov/History/Major-Operations/SRE-Workshop-2009.html

4. ENVIRONMENTAL PROGRAM INFORMATION

At SSFL, the DOE Site Closure Program Office has programmatic responsibility for the former radiological facilities, former sodium test facilities, and related cleanup operations. DOE Site Closure is responsible for environmental restoration and waste management operations in Area IV, where DOE funded programs conducted energy related research and development. Environmental restoration activities include decontamination and decommissioning (D&D) of radioactively contaminated facilities, building demolition, treatment of sodium, assessment and remediation of soil and groundwater, surveillance and maintenance of work areas, and environmental monitoring. Waste management activities include waste characterization and certification, storage, treatment, and off-site disposal. Waste management activities are performed at the Radioactive Materials Handling Facility (RMHF) for radioactive and mixed waste. The Hazardous Waste Management Facility (HWMF) has been used to handle alkali metal waste, but it is now inactive and awaiting closure pending completion of the EIS.

4.1 ENVIRONMENTAL PROTECTION AND REMEDIATION

Oversight of environmental protection at SSFL is the responsibility of Boeing's Environment, Health and Safety (EHS) department. This department provides support for environmental management and restoration. The stated policy of EHS is "To support the company's commitment to the well-being of its employees, community, and environment. It is Boeing's policy to maintain facilities and conduct operations in accordance with all federal, state, and local requirements and contractual agreements. Boeing employees are responsible for implementing and complying with this policy." Responsibilities for environmental protection at Boeing SSFL fall under four sub-departments: Environmental Protection (EP), Environmental Remediation (ER), Radiation Safety (RS), and the ETEC Closure Program Office. The responsibilities for each are listed below.

Environmental Protection (EP) is responsible for developing and implementing cost-effective and efficient programs designed to ensure achievement of the policy objectives related to environmental protection. The EP responsibilities include:

- Ensuring compliance with applicable federal, state, and local rules and regulations, including maintaining a working knowledge of applicable environmental laws, performing compliance audits, reviewing new and modified facility projects, coordinating solid and hazardous waste disposal, maintaining required records, preparing and submitting required regulatory reports, applying for and maintaining permits, assuring compliance with permit conditions, and performing sampling and analysis.

- Responding to uncontrolled releases and reporting releases as required by law and contractual requirements.

- Suspending operations determined to be in violation of environmental regulations.

- Participating in rule and regulation development, including evaluating impacts on Boeing programs; coordinating with other Boeing functions, as appropriate; and informing management and staff of new or revised requirements.

- Providing a program, in conjunction with Technical Skills and Development, for motivating, informing, and training employees about their duties to comply with environmental regulations and protect the environment.

- Recognizing and responding to the community's concerns regarding the environmental impact of Boeing operations, including escorting and cooperating with regulatory officials interested in environmental matters and responding to requests for information referred to Communications.

- Working with Boeing customers and suppliers to minimize the use of materials and processes that impact the environment while maintaining product quality and competitive pricing.

- Making environmental concerns, including energy and raw material conservation, a priority when evaluating new and existing operations and products or when making decisions regarding land use, process changes, materials purchases, and business acquisitions.

The Radiation Safety (RS) function of Health, Safety & Radiation Services is responsible for providing radiological support for the D&D of radiological contamination at all Boeing SSFL facilities. The RS responsibilities include:

- Compliance with all federal, state, and local regulations pertaining to occupational and environmental radiation protection.

- Provision of health physics oversight of D&D and radioactive waste management activities.

- Performance of final surveys of D&D'd buildings and facilities to demonstrate acceptability for release for unrestricted use.

- Response to employee and public concerns regarding radiological activities and the impact of these activities on the health and safety of the community.

Environmental Remediation (ER) is responsible for remedial actions to clean up historical chemical contamination at all Boeing SSFL facilities. The ER responsibilities include:

- Compliance with all federal, state, and local regulations pertaining to environmental remediation.

- Remediation of historical chemically contaminated Boeing SSFL sites to achieve closure.

- Implementation of groundwater monitoring and treatment.

- Implementation of RCRA soil sampling and cleanup activities.

ETEC Closure is responsible for managing the D&D of former DOE nuclear, liquid metal test, and other (e.g., office and warehouse) facilities in support of the ETEC Closure program. ETEC Closure responsibilities also include:

- Responsibility for the management and shipment to DOE-approved disposal sites of radioactive waste generated during the D&D operations.

- Operation of the Radioactive Materials Handling Facility (RMHF) under an interim status Part A permitted facility for the management of mixed (radioactive and hazardous) wastes.

- Performance of the routine Surveillance and Maintenance (S&M) activities for DOE-owned facilities to ensure that the buildings are properly maintained such that the buildings do not create personnel or environmental safety hazards.

- Responsibility for identifying, removing, staging, and initiating documentation for DOE equipment being divested.

4.2 ENVIRONMENTAL MONITORING PROGRAM

The purpose of the environmental monitoring program is to detect and measure the presence of hazardous and radioactive materials, maintain compliance with federal, state, and local laws and regulations, and identify other undesirable impacts on the environment. It includes remediation efforts to correct or improve contaminated conditions at the site and prevent off-site impact. For this purpose, the environment is sampled and monitored, and effluents are analyzed. A goal of this program is to demonstrate compliance with applicable regulations and protection of human health and the environment. Environmental restoration activities at the SSFL include a thorough review of past programs and historical practices to identify, characterize, and correct all areas of potential concern. The key requirements governing the monitoring program are 5400.5 (DOE, 1993) and DOE Order 231.1A (DOE, 2004). Additional guidance is drawn from California regulations and licenses, and appropriate standards.

The basic policy for control of radiological and chemical materials requires that adequate containment of such materials be provided through engineering controls, that facility effluent releases be controlled to federal and state standards, and that external radiation levels be reduced to as low as reasonably achievable (ALARA) through rigid operational controls. The environmental monitoring program provides a measure of the effectiveness of these operational procedures and of the engineering safeguards incorporated into facility designs.

4.2.1 Historical Radiological Monitoring

Monitoring the environment for potential impact from our past nuclear operations has been a primary focus of Boeing and its predecessors.

In the mid 1950s, Atomics International (AI), then a Division of North American Aviation (NAA), began initial plans for nuclear research at its facilities in the west San Fernando Valley. In 1955, prior to initial operations, it started a comprehensive monitoring program to sample and monitor environmental levels of radioactivity in and around its facilities.

During the half century history of nuclear research and later environmental restoration, on-site and off-site environmental monitoring and media sampling have been extensive. In the early years, soil/vegetation sampling was conducted monthly. Sampling locations extended to the Moorpark freeway to the west, to the Ronald Reagan freeway to the north, to Reseda Avenue to the east, and to the Ventura freeway to the south. Samples were also taken around the Canoga and De Soto facilities as well as around the Chatsworth Reservoir. This extensive off-site sampling program was terminated in 1989 when all nuclear research and operations (except remediation) came to an end.

During the 1990s, extensive media sampling programs were conducted in the surrounding areas, including the Brandeis-Bardin Institute and the Santa Monica Mountains Conservancy to the north, Bell Canyon to the south, the Rocketdyne Recreation Center in West Hills to the east, and various private homes in the Chatsworth and West Hills areas. Samples were also taken from such distant areas as Wildwood Park and Tapia Park. In addition, monitoring of off-site radiation, groundwater, and storm water runoff from the site were routinely performed during this time. Figure 4-1 shows sampling and monitoring locations for these two time periods, and Table 4-1 shows a matrix of sampled media, organizations, and time periods for all historical off-site radiological monitoring.

Boeing's ongoing radiological environmental monitoring ensures that activities at the SSFL, including cleanup, do not adversely affect either its employees or its neighbors.

Additional details about onsite and offsite monitoring are available at:
http://www.etec.energy.gov/Health-and-Safety/Environmental-Monitoring.html
http://www.etec.energy.gov/Health-and-Safety/Community.html

In December 2007, Boeing issued a comprehensive Offsite Data Evaluation Report compiling all chemical and radiological offsite sample data taken during the last two decades.
http://www.etec.energy.gov/Health-and-Safety/Offsite-Report.html

In February 2008, Boeing issued a comprehensive GIS map based database of all chemical and radiological offsite and onsite sample data.

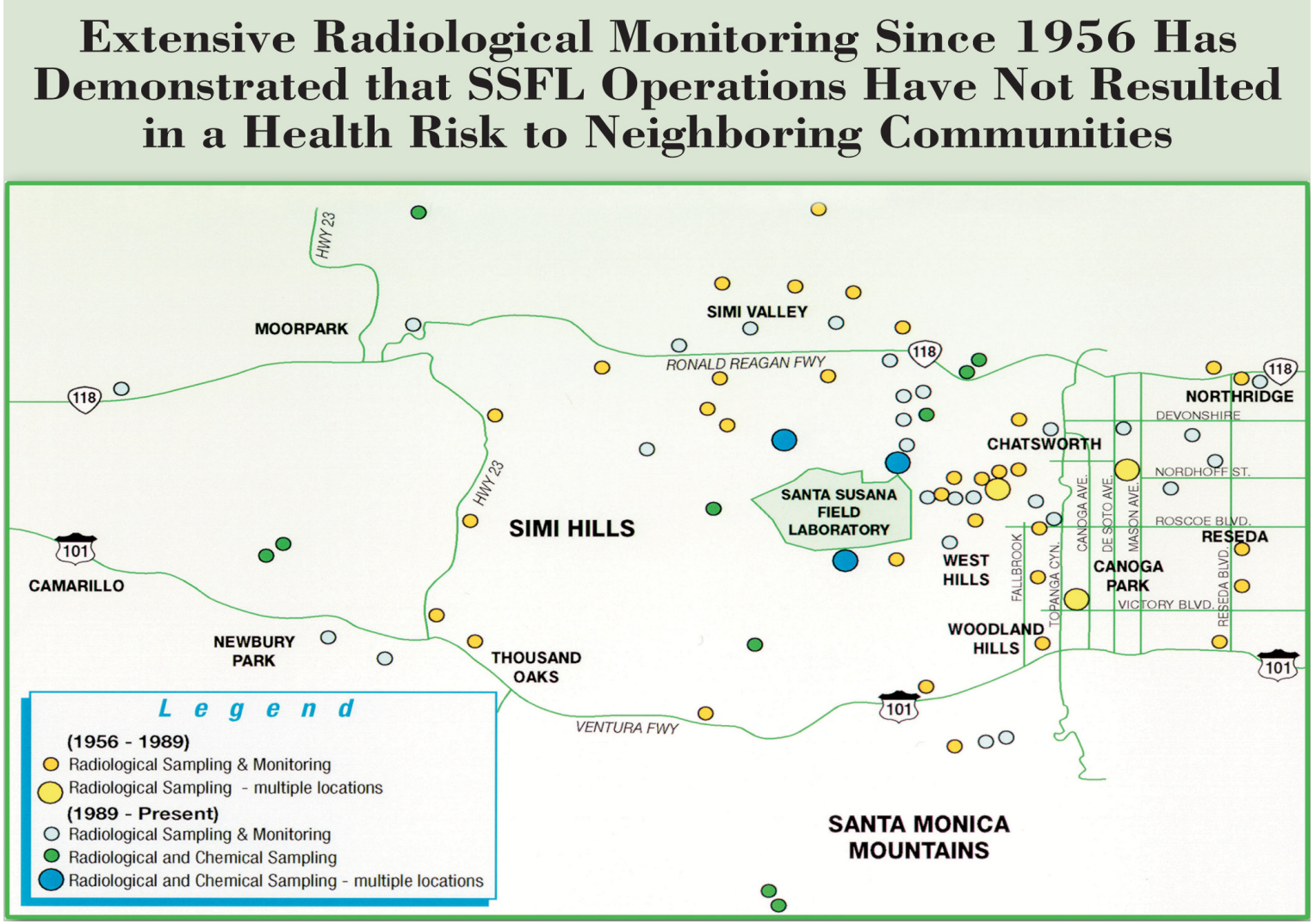

Figure 4-1. Radiological Sampling and Monitoring Locations

Table 4-1. Organizations Conducting Radiological Environmental Sampling

Environmental Sampling for Radiation/Radioactivity Surrounding Santa Susana					
Location	**Media Sampled (Date Range and Organization)**				
	Soil	**Groundwater**	**Surface water**	**Airborne Particulates**	**Radiation Exposure**
On-site	1956-Present (Boeing[a]) 1975,81,84 (ANL) 1986-87 (ORAU) 1992-Present (ORISE) 1993 (RWQCB) 1992-Present (DPH-RHB) 1994-95 (DPH-EMB)	1960-86 (Boeing) 1984-Present (GRC) 1998 (EPA-ORIA)	1970-Present (Boeing) 1993-98 (RWQCB)	1956-Present (Boeing)	1971-Present (Boeing) 1975,81,84 (ANL) 1981-Present (DPH-RHB) 1986-87 (ORAU) 1992-Present (ORISE)
North Off-site	1956-89 (Boeing) 1992-94 (McLaren-Hart) 1992-94 (EPA-ORIA) 1992-94 (DPH-EMB) 1991-97 (Cehn) 1995 (Boeing) 1995 (ORISE)	1984-Present (GRC) 1991-96 (Cehn) 1998 (EPA-ORIA)	1992-94 (McLaren-Hart) 1992-94 (EPA-ORIA) 1992-94 (DPH-EMB) 1992-94 (Cehn)	1989 (DPH-RHB & LLNL)	1974-Present (Boeing) 1992-94 (EPA-ORIA) 1995 (ORISE)
East Off-site	1956-89 (Boeing) 1986 (ORAU) 1994 (Boeing) 1995 (ORISE) 1997 (LLNL)	1984-Present (GRC)	1961-71 (Boeing)	1959-Present (Boeing)	1974-Present (Boeing) 1986 (ORAU) 1995 (ORISE)
South Off-site	1956-89 (Boeing) 1992-94 (McLaren-Hart) 1992-94 (EPA-ORIA) 1992-94 (DPH-EMB) 1992-94 (Cehn) 1995 (Boeing) 1998 (Ogden)	1984-Present (GRC)	1966-89 (Boeing)	1989 (DPH-RHB & LLNL)	1974-Present (Boeing)
West Off-site	1956-64 (Boeing) 1992-94 (McLaren-Hart) 1992-94 (EPA-ORIA) 1992-94 (DPH-EMB) 1992-94 (Cehn) 1995 (Boeing)	1984-Present (GRC)	None	None	1974-Present (Boeing)

a) Including Boeing and previous site operators, Rocketdyne Propulsion & Power and Atomics International.

4.2.2 Nonradiological Monitoring

Extensive monitoring programs for chemical contaminants in air, soil, surface water, and groundwater are in effect to assure that the existing environmental conditions do not pose a threat to the public welfare or the environment. Extensive soil sampling is being performed under the Resource Conservation and Recovery Act Facility Investigation and other site-specific remedial programs. Groundwater beneath Area IV was extensively monitored for chemical contaminants. Both Chatsworth Formation wells and shallow wells were utilized to monitor groundwater conditions in Area IV. Groundwater analyses were conducted by Haley & Aldrich using a DTSC-approved sampling and analysis plan and EPA-approved analytical methods and laboratories.

All surface water discharges were monitored as specified in the National Pollutant Discharge Elimination System (NPDES) permit, which was most recently revised on May 19, 2009. All sources of air emissions were monitored as required by the Ventura County Air Pollution Control District (VCAPCD).

In addition to the environmental monitoring and restoration programs, current operational procedures reflect Boeing's commitment to a clean and safe environment. For example, solvents and oils are collected and recycled rather than being discarded. A comprehensive training and employee awareness program is in place. All employees working with hazardous materials are required to attend a course on hazardous materials waste management. Environmental bulletins are printed on the Boeing website to promote environmental awareness among all employees.

4.3 INTEGRATED SAFETY MANAGEMENT SYSTEMS (ISMS)

The ETEC *Integrated Safety Management System (ISMS)* description document strategically incorporates key safety principles into daily work processes. This document prescribes a formal, organized process to ensure worker health and safety, and includes a built-in mechanism for self-assessment and continuous improvement. In addition to noting accomplishments and improvements, the Annual ISMS Report reemphasizes the policies and procedures that help the organization comply with ISMS principles. The Annual ISMS Report also contains metrics monitored by Environment, Health and Safety (EHS) to assess improvement in safety practices. The CY 2008 Annual ISMS Report submittal was finalized in July 2009 (Boeing, 2009). The report for CY 2009 will be prepared for timely submittal.

During 2009, Boeing SSFL continued implementing ISMS principles. The self-assessment plan incorporates tools such as DOE Lessons Learned Reports, DOE ORPS (Occurrence Reporting and Processing System) Reports, and DOE Operating Experience Reports. Safety issues were emphasized with Boeing subcontractors by having an EHS representative present safety requirements and information prior to the start of each job. Periodic ISMS subcontractor audits were performed to ensure that safety requirements were being met while work was in progress.

To ensure that the ISMS continues to reflect current Boeing policies, procedures, processes and business organization within the context of the ISMS principles, related program documents are regularly reviewed and updated. Updates for the following documents were completed for 2009:

- ETEC Closure Contract Integrated Safety Management System Description
- Health & Safety Plan for DE-AC03-99SF21530 (EPA-00060, 6/02/2009)
- 10 CFR 851 Compliance Plan (EPA-00062, 5/29/09)

4.4 ENVIRONMENTAL TRAINING

Boeing conducts training and development programs as an investment in human resources to meet both organizational and individual goals. These programs are designed to improve employee performance, ensure employee proficiency, prevent obsolescence in employee capability, and prepare employees for changing technology requirements and possible advancement.

The Human Resources organization is responsible for the development and administration of formal training and development programs. Process managers are responsible for individual employee development through formal training, work assignments, coaching, counseling, and performance evaluation. Process managers and employees are jointly responsible for defining and implementing individual training development goals and plans, including on-the-job training.

The Boeing Santa Susana Environment, Health and Safety (EHS) organization currently maintains a list of 68 EHS courses for Boeing Santa Susana personnel. Classes are available as both computer-based training and instructor-lead training. Training is also available to employees through Boeing's Learning, Training and Development (LTD) website. Specialized training programs on new technological developments and changes in regulations are provided, as needed, to ensure effective environmental protection and worker health and safety. Additional off-site courses are also encouraged.

4.5 WASTE MINIMIZATION AND POLLUTION PREVENTION

4.5.1 Program Planning and Development

A Waste Minimization and Pollution Prevention Awareness Plan is in place and serves as a guidance document for all waste generators at ETEC. The plan emphasizes management's proactive policy of waste minimization and pollution prevention, and outlines goals, processes, and waste minimization techniques to be considered for all waste streams generated at the former ETEC. The plan requires that waste minimization opportunities for all major restoration projects be identified and that all cost-effective waste reduction options be implemented.

The majority of waste currently generated at the former ETEC results from environmental restoration of surplus facilities (now on hold pending completion of EIS) and cleanup of contaminated sites from previous programs. The key components of waste generated at ETEC are:

- Low-level radioactive waste (LLW), mixed, hazardous, and non-hazardous wastes from D&D operations.

- Oils from ongoing remediation and O&M activities.

Waste minimization is accomplished by evaluating the waste generating processes, identifying waste minimization options, and finally conducting technical and economic evaluations to determine the best approach.

4.5.2 Training and Awareness Programs

The ETEC Waste Minimization and Pollution Prevention Awareness Program includes (1) orientation programs and refreshers, (2) specialized training, and (3) incentive awards and recognition. Employees are reminded about pollution prevention and waste minimization awareness. Posters are placed in work areas to notify employees about environmental issues or practices. Presentations using visual aids are provided, as needed, to review major changes in environmental issues.

4.5.3 Waste Minimization and Pollution Prevention Activities

The following are some significant activities related to waste minimization and pollution prevention:

- Oils used in motor vehicles and compressors are shipped to vendors who recycle them.

- Hazardous waste containers in acceptable condition are reused to the maximum extent possible.

- Empty product drums returned to the vendor for reuse when practical.

4.5.4 Tracking and Reporting System

Various categories of materials from procurement to waste disposal are tracked. Radioactive and mixed wastes are transferred to the RMHF, logged, characterized, and stored at the RMHF. Documents that accompany the wastes are verified for accuracy and completeness, and filed at the RMHF. Hazardous waste tracking and verification procedures (from generator to final off-site disposal) are followed by the EHS department. In March 2010, Boeing published the EPA Biennial Hazardous Waste Report.

4.5.5 Low Level Waste Shipment

In 2009, approximately 13.5 cubic meters of low level waste were shipped to NTS for disposal. The waste shipment included low level radioactive water generated during site characterization and investigation activities (e.g., rinse water for cleaning sampling tools and/or purge water from groundwater monitoring wells). The waste water was absorbed in diatomaceous earth and shipped in 55-gallon drums. Also included in the shipment were Personal Protective Equipment (PPE), such as gloves and protective clothing, equipment and office furniture that had been used in the RMHF. The waste was non-hazardous and was slightly contaminated with radiological constituents.

4.6 PUBLIC PARTICIPATION

During 2009, DOE participated in numerous meetings with regulators and other government agencies, including DTSC and EPA to discuss technical issues, on-going studies, and public involvement issues. This included participation in SSFL Interagency Workgroup meetings and other stakeholder meetings, such as those with the West Hills Neighborhood Council and community meetings at the Aerospace Cancer Museum of Education, Los Angeles.

Eleven tours were hosted for individuals from various groups including Congressional and elected official staff members, regulators, U.S. Fish and Wildlife Service, California Native Plant Society, California State University, Northridge, former workers, newspaper reporters, Native Americans, West Hills Neighborhood Council, the Aerospace Cancer Museum of Education, the Santa Susana Mountain Park Association, and stakeholders with interests in cultural resources and biological survey plans.

DOE continued its participation in biweekly meetings with NASA, Boeing, USEPA, DTSC, and the Los Angeles Regional Water Quality Board staff to coordinate public outreach efforts.

In 2009, DOE sponsored a meeting and workshop entitled, “Diverse Perspectives on the July 1959 Sodium Reactor Experiment (SRE) Accident.” At the meeting, three independent technical experts presented briefings, summarized, and interpreted more than 80 historical documents on

the nuclear reactor accident. More than 185 workshop attendees had an opportunity to ask questions of these experts. Finally, community members had an opportunity to provide their own perspectives on what occurred. All meeting materials were placed on the ETEC website at: http://www.etec.energy.gov/History/Major-Operations/SRE-Workshop-2009.html.

In addition, DOE developed the Introduction to Santa Susana Field Laboratory and the Energy Technology Engineering Center fact sheet and the Draft Cultural Resources Survey at Area IV and the Northern Undeveloped Lands, Santa Susana Field Laboratory fact sheet.

In 2009, DOE published three CleanUpdate newsletters with articles on the latest project activities in April, August and November 2009 and distributed three press releases with SSFL Area IV updates during the year.

DOE added more than 100 new documents to the website last year and had 13,801 visitors, who made 18,675 visits. The majority of visits – 15,638 – were from internet users in the U.S. Additional visits came from 116 other countries or territories.

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5. ENVIRONMENTAL RADIOLOGICAL MONITORING

The environmental radiological monitoring program at SSFL started before the first radiological facility was established in 1956. The program has continued with modifications to suit the changing operations. The selection of monitoring locations was based on several site-specific criteria such as topography, meteorology, hydrology, and the locations of the nuclear facilities. The prevailing wind direction for the SSFL site is generally from the northwest, with some seasonal diurnal shifting to the southeast quadrant. Most rainfall runoff at the SSFL site flows through several natural watercourses and drainage channels and is collected in two large-capacity retention ponds. This water may be discharged off-site into Bell Creek to the south, or it may be reused for industrial purposes. The runoff water from Area IV also flows to the northwest, which is monitored through five NPDES sampling locations.

Ambient and ventilation exhaust air samples are measured for gross alpha and gross beta for screening purposes. These screening measurements can quickly identify any unusual release and provide long-term historical records of radioactivity in the environment. At the end of each year, the air samples for the entire year are combined and analyzed for specific radionuclides. The isotopic analysis results are used for estimating the potential off-site dose from air pathway.

Groundwater and surface water samples are analyzed for radioactivity, and the results are compared with the limits established by the EPA for suppliers of drinking water. The analyses include gross alpha and gross beta, tritium, Sr-90, radium-226, radium-228, isotopic thorium, isotopic uranium, and gamma emitters.

Direct radiation is monitored by the thermoluminescent dosimeters (TLDs) located on the site boundary and throughout the site. To accurately measure low-level ambient radiation, "sapphire" TLDs, which are very sensitive to low-level radiation, are used. These TLDs are complemented by TLDs installed by the State of California Department of Health Services Radiologic Health Branch for independent surveillance.

5.1 AIR EFFLUENT MONITORING

The only potential emission source at the DOE facility at SSFL is the exhaust stack at the Radioactive Materials Handling Facility (RMHF). In May 2007, DOE suspended all Decontamination and Decommissioning (D&D) operations at SSFL. As a result, the entire facility was placed into a safe shutdown mode, and no effluents were released to the atmosphere through the stack in 2009.

The EPA limit for a DOE site is 10 mrem/yr, as specified in 40 CFR 61, Subpart H. The regulation also specifies that radiation exposure dose to the Maximally Exposed Individual (MEI) be calculated using the EPA's CAP88PC computer model. Due to the fact that no effluents were released to the atmosphere from the DOE facility at SSFL in 2009, the potential radiation exposure dose to the MEI was zero.

5.2 ENVIRONMENTAL SAMPLING

5.2.1 Ambient Air

Due to the temporary suspension of D&D operations at SSFL, the number of environmental stations was reduced in 2009. The sampling locations, both operating and discontinued, are shown in Figure 5-1 and listed in Table 5-1.

During 2009, ambient air sampling was performed continuously at SSFL with air samplers operating on 7-day sampling cycles. Airborne particulate radioactivity was collected on glass fiber (Type A/E) filters that were changed weekly. The samples were counted for gross alpha and beta radiation following a minimum 120-hour decay period to allow the decay of short-lived radon and thoron daughters. The volume of a typical weekly ambient air sample was approximately 50.4 m^3.

Weekly ambient air samples were counted for gross alpha and beta radiation with a low-background, thin-window, gas-flow proportional-counting system. The system is capable of simultaneously counting both alpha and beta radiation. The sample-detector configuration provides a nearly hemispherical (2π) geometry. The thin-window detector is continually purged with argon/methane counting gas. A preset time mode of operation is used for counting all samples.

Counting system efficiencies were determined routinely with Technetium-99 (Tc-99) and Thorium-230 (Th-230) standard sources. The activities of the standard sources are traceable to the National Institute of Standards and Technology (NIST).

Filter samples for each ambient air sampling location were combined annually and analyzed for isotopic-specific activity. The ambient air sampling results, as shown in Table 5-2, had radionuclide concentrations far below the DCG values. The variability in the measurements was primarily due to weather effects, as well as analytical and background variations.

It should be noted that these measurements determine only the long-lived particulate radioactivity in the air and, therefore, do not show radon (Rn-222) and most of its progeny. Polonium-210 is a long-lived progeny and is detected by these analyses.

The gross radioactivity guidelines for SSFL site ambient air are based on the reference values in DOE Order 5400.5 (DOE, 1993). The conservative guide value for alpha activity is 2×10^{-14} μCi/mL, and the value for beta activity is 9×10^{-12} μCi/mL. A complete list of the results from the gross alpha and gross beta counting of the ambient air samples is given in Table 5-3.

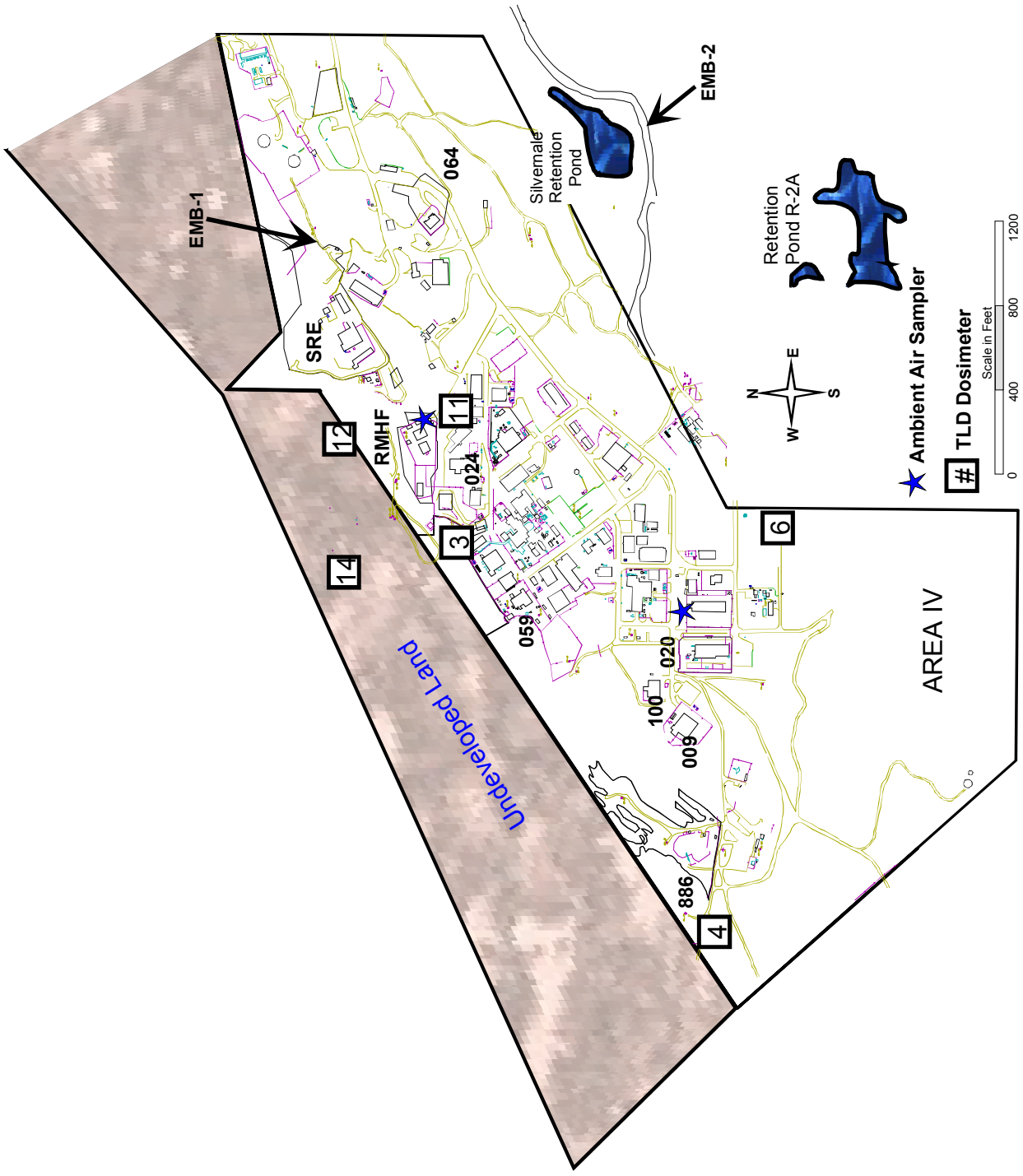

Figure 5-1. Map of Santa Susana Field Laboratory Area IV Sampling Stations

Table 5-1. Sampling Location Description

Station	Location	Sampling Frequency
Ambient Air Sampler Locations		
A-2	SSFL Site, 4020, northeast of former 4020 site	(W)
A-3	SSFL Site, RMHF Facility, next to 4034	(W)
A-4	SSFL Site, 4886, Former Sodium Disposal Facility	Discontinued
A-5	SSFL Site, RMHF Pond, north side	Discontinued
A-6	SSFL Site, 4100, east side	Discontinued
On-site - SSFL - Ambient Radiation Dosimeter Locations		
SS-3 (CA)	SSFL Site, Electric Substation 719 on boundary fence	(Q)
SS-4 (CA)	SSFL Site, west boundary on H Street	(Q)
SS-6 (CA)	SSFL Site, northeast corner of 4353	(Q)
SS-7 (CA)	SSFL Site, 4363, north side	Discontinued
SS-8 (CA)	SSFL Site, Former Sodium Disposal Facility north boundary	Discontinued
SS-9 (CA)	SSFL Site, RMHF northeast boundary at 4133	Discontinued
SS-11 (CA)	SSFL Site, 4036, east side	(Q)
SS-12 (CA)	SSFL Site, RMHF northwest property line boundary	(Q)
SS-13 (CA)	SSFL Site, RMHF northwest property line boundary	Discontinued
SS-14 (CA)	SSFL Site, RMHF northwest property line boundary	(Q)
SS-15 (CA)	SSFL Site, RMHF northwest property line boundary	Discontinued
EMB-1 (CA)	SSFL Site, SRE area north of 4003	Discontinued
EMB-2 (CA)	SSFL Site, south of Silvernale retention pond, off Test Area Road	Discontinued
Off-site Ambient Radiation Dosimeter Locations		
OS-1 (CA)	SSFL Front Gate	(Q)
BKG-11	Background Location, West Hills	(Q)
BKG-12	Background Location, Somis	Discontinued
BKG-13	Background Location, Hollywood	Discontinued
BKG-15	Background Location, Calabasas	Discontinued
BKG-18	Background Location, Agoura	Discontinued
BKG-19	Background Location, Westlake Village	(Q)
BKG-22	Background Location, Saugus	Discontinued

Codes		**Locations**	
A	Air Sampler Station	SS	SSFL
W	Weekly Sample	OS	Off-site
Q	Quarterly Sample	BKG	Background
CA	State Confirmatory Location	EMB	Environmental Management Branch

Table 5-2. Ambient Air Specific Isotopes – 2009

Radionuclide	Derived Conc. Guide	RMHF	4020	Average (% of DCG)
	(μCi/mL)			
H-3	1E-07	NA	NA	NA
Be-7	natural	ND	ND	NA
K-40	natural	ND	ND	NA
Mn-54	2E-9	ND	ND	NA
Co-60	8E-11	ND	ND	NA
Sr-90	9E-12	ND	ND	NA
Cs-137	4E-10	ND	ND	NA
Po-210	natural	2.82E-15	1.10E-15	1.96E-15 (NA)
Th-228	4E-14	ND	ND	NA
Th-230	4E-14	9.70E-17	1.26E-16	1.11E-16 (0.3%)
Th-232	7E-15	ND	4.64E-17	2.32E-17 (0.3%)
U-234	9E-14	1.67E-17	5.14E-17	3.41E-17 (0.04%)
U-235	1E-13	ND	1.26E-17	6.28E-18 (0.01%)
U-238	1E-13	3.88E-17	7.34E-17	5.61E-17 (0.06%)
Pu-238	3E-14	ND	ND	NA
Pu-239/240	2E-14	ND	ND	NA
Pu-241	1E-12	ND	ND	NA
Am-241	2E-14	ND	ND	NA

NA = Not applicable
ND = Not detected

Table 5-3. Ambient Air Gross Alpha and Gross Beta—2009

Area	Activity	Number of Samples	Gross Radioactivity	
			Average Concentrations[a] (μCi/mL)	Average Percent of Guide[b]
SSFL Area IV 4020	Alpha	51	8.02E-15	40.09%
	Beta		2.43E-14	0.27%
SSFL Area IV RMHF	Alpha	51	7.41E-15	37.06%
	Beta		2.26E-14	0.25%

[a]Values include natural background.
[b]Guidelines for SSFL site: 2E-14 μCi/mL alpha, 9E-12 μCi/mL beta, DOE Order 5400.5 (02/08/90).

5.2.2 Groundwater

Both Chatsworth Formation wells and shallow wells are utilized to monitor groundwater conditions in Area IV. The locations of these wells are shown in Figure 6-2. The purpose of these wells is to monitor concentrations of chemicals and/or radioactivity released by DOE operations. Water samples from these wells are periodically analyzed for gross alpha, gross beta, H-3, K-40, Sr-90, Ra-226, Ra-228, isotopic thorium, isotopic uranium, and man-made beta/gamma emitters. Complete sampling schedule and analytical results are presented in the 2009 Annual Groundwater Report, which can be found at:
http://www.etec.energy.gov/Cleanup/Groundwater_Monitoring.html

A small amount of Sr-90 was detected in well RD-98 in 2008. The well was installed at the RMHF leach field as a part of the on-going Data Gap Investigation for Radiological Constituents in groundwater in Area IV of the SSFL. The detected Sr-90 concentrations ranged from 2.18 to 2.63 pCi/L, which are less than the drinking water MCL of 8 pCi/L.

In previous years, relatively high tritium levels were detected in some of the wells located down gradient from the former Building 4010 site, including RD-87 -88, -90, -93, -94 and -95. These high tritium wells were not sampled for tritium during 2009. All other tritium results during 2009 were less than the drinking water MCL of 20,000 pCi/L and were comparable to past results.

Both filtered and unfiltered samples were taken at selected wells to study the effect of filtering on sampling results. Results indicate that there is no systematic difference between filtered and unfiltered samples.

5.2.3 Surface Water

Most of Area IV slopes toward the southeast, and rainfall runoff is collected by a series of drainage channels and accumulates in the R2A Pond. Water from this pond is eventually released to Bell Creek under the NPDES permit. Some of Area IV slopes to the northwest, and a small amount of rainfall drains toward the northwest ravines, which lead into Meier Canyon. To permit sampling of this runoff, five catch basins were installed in 1989 near the site boundary to accumulate runoff.

The NPDES Permit No. CA0001309 requires that a discharge monitoring report (DMR) for the Santa Susana Field Laboratory (SSFL) be published annually. This annual DMR provides information and data, including summary tables of surface water sample analytical results, rainfall summaries, liquid waste shipment summaries, and analytical laboratory QA/QC procedures and certifications. For the period of January 1, 2009 through December 31, 2009, the NPDES discharge data are provided in the 2009 Quarterly and Annual NPDES Discharge Monitoring Report (Boeing, 2010).

The 2009 Quarterly and Annual NPDES Discharge Monitoring Reports are also available at:
http://www.boeing.com/aboutus/environment/santa_susana/ents/monitoring_reports.html

5.2.4 Soil

No environmental soil sampling was conducted in Area IV during 2009.

5.2.5 Vegetation

No vegetation samples were collected in 2009.

5.2.6 Wildlife

No animal samples were collected in 2009.

5.2.7 Ambient Radiation

From 1974 to 1989, the ambient radiation monitoring program used complicated bulb-type dosimeters (CaF_2:Mn). This usage was justified by the amount of nuclear materials handled in the operations at SSFL and De Soto, and by the low levels of radiation in the environment. At the termination of all nuclear work in 1988, such a program was no longer needed, and efforts were directed toward simplifying the program. This simplification was initially accomplished by using the dosimeters (LiF) that were well established in use for monitoring personnel engaged in radiation work. While these dosimeters are well suited to measuring exposures in the range of interest for compliance with occupational radiation regulations (doses "above background"), they are somewhat insensitive for environmental measurements, since they have a resolution, in terms of dose increments, of only 10 mrem per quarter. Using these dosimeters, Boeing SSFL demonstrated that environmental exposures did not reach regulatory limits, but obtained only limited information on the actual exposure rates present around the facilities and in the neighboring environment.

In addition to the LiF TLDs discussed above, Boeing SSFL began deploying, in the last quarter of 1995, environmental TLDs that use an aluminum oxide ("sapphire") chip. These TLDs are capable of determining doses in increments of 0.1 mrem (compared to 10 mrem for the LiF-based badges previously used). In addition, the aluminum oxide badge reporting is much more detailed, providing both gross and corrected readings for the locations. Proper use of the control badges supplied with these dosimeters allows elimination of the natural and transportation exposure that occurs before, during, and after the deployment of the environmental dosimeters to measure the ambient radiation. This usage permits accurate determination of the net exposure received while the environmental TLDs are in the field, exposed to the ambient radiation. In various intercomparisons, aluminum-oxide-based dosimeters have been shown to be among the most accurate dosimeters available in measuring environmental exposure rates.

The State DPH/RHB provides packages containing calcium sulfate ($CaSO_4$) dosimeters for independent monitoring of radiation levels at SSFL and in the surrounding area. These

dosimeters are placed at specific locations along with the Boeing TLDs. The State dosimeters are returned to the Radiologic Health Branch for evaluation. Data obtained in 2009 on these TLDs, which were placed at various Boeing dosimeter locations both on-site and off-site, are shown in Table 5-5. The small differences between the Boeing and DPH results are mainly due to the fact that two different types of TLDs were used in the measurement.

The natural background radiation level as measured by the off-site TLDs ranges from 47 to 74 mrem/yr. At SSFL, the local background ranges from 66 to 87 mrem/yr, based on the data from dosimeters SS-3, -4, -6, and -11 as shown in Table 5-5. The variability observed in these values can be attributed to differences in elevation and geologic conditions at the various sites. The altitude range for the dosimeter locations is from approximately 260 m (850 ft) ASL at two off-site locations (BKG-11 and BKG-19) to a maximum of approximately 580 m (1,900 ft) ASL at SSFL. Many of the SSFL TLD locations are also affected by proximity to sandstone rock outcroppings, a condition that results in elevated exposure levels. Radiation doses measured at locations SS-12 and -14 are slightly higher than the rest of the locations on-site. This result could be a result of the waste handling and storage operations at the RMHF.

Table 5-5. 2009 SSFL Ambient Radiation Dosimetry Data

TLD-Locations		Annual Exposure (mrem) By Boeing	Average Exposure Rate (μR/h)	
			Boeing	State DPH
SSFL	SS-3	65.8	7.5	7.2
	SS-4	76.6	8.7	9.1
	SS-6	86.5	9.9	8.7
	SS-11	73.5	8.4	8.0
	SS-12	89.7	10.2	9.9
	SS-14	80.8	9.2	11.4
Mean Values		**78.8**	**9.0**	**9.1**
Off-site	OS-1	74.0	8.5	7.2
	BKG-11	54.8	6.3	
	BKG-19	46.5	5.3	
Mean Values		**58.5**	**6.7**	**7.2**

The external exposure rate at Boeing SSFL's northern property boundary, the closest property boundary to the RMHF, is indistinguishable from natural background. This property line is approximately 300 meters from the RMHF and separated by a sandstone ridge that effectively shields the boundary from direct radiation from the RMHF. Dosimeters placed on the RMHF side of this sandstone ridge (SS-12 and –14), approximately 150 meters from the RMHF, read an average of 9.7 mrem/year above the local background. This amount is considerably below the 100 mrem/year limit specified in DOE Order 5400.5, *Radiation Protection of the Public and the Environment*. The TLD results demonstrate that the potential external exposure at the site boundary is below the DOE's dose limit.

The SSFL local background, calculated as the average of all onsite TLDs (excluding SS-12 and SS-14), is 76 mrem/year. This value is 17 mrem/year higher than the average of offsite background of 59 mrem/year. This result can be attributed to the contribution of higher elevation and different geology. Offsite TLDs are located in Boeing staff members' backyards, surrounded by natural soil. In contrast, SSFL lies atop the Chatsworth Formation. The Chatsworth Formation is composed of arkosic sandstone, rich in feldspar. Arkosic rocks are often high in uranium content. As a result, the Chatsworth Formation rocks produce higher radiation exposure than the soil of the surrounding valleys.

5.3 ESTIMATION OF RADIATION DOSE

5.3.1 Individual Dose

In accordance with regulations, the total effective dose equivalent (TEDE) to any member of the public from all pathways (combining internal and external dose) shall not exceed 100 mrem/yr (above background) for DOE facilities. Although the two TLD monitoring stations to the north of the RMHF, namely SS-12 and –14, recorded an external dose level at 9.7 mrem above the local background, the actual dose at the property boundary is likely to be indistinguishable from the natural background. This is because the high rocky terrain between the actual property line and the TLD monitoring stations acts as an effective shield and makes the exposure from direct radiation at the property line indistinguishable from background. Exposure from direct radiation at the nearest residence would also be indistinguishable from background for the same reason.

Due to the fact that no effluents were released to the atmosphere through the RMHF stack in 2009, the potential internal dose from airborne releases is zero mrem. For DOE operations, the air pathway standard is 10 mrem/yr (CEDE), as established by EPA.

Public exposure to radiation and radioactivity is shown in Table 5-6. The table presents the estimated exposures in comparison to the regulatory standards. Dose values in the tables represent both internal and external exposures.

Table 5-6. Public Exposure to Radiation from DOE Operations at SSFL

1.	**All pathways**	
	1. Maximum estimated external dose to an individual from direct radiation	0 mrem/yr
	2. Maximum estimated internal dose to an individual	0 mrem/yr
	Limit ("Radiation Protection of the Public and the Environment" DOE Order 5400.5)	100 mrem/yr
2.	**Air pathway (reported in NESHAPs report)**	0 mrem/yr
	Limit (40 CFR 61, Subpart H)	10 mrem/yr

5.3.2 Population Dose

Since no effluents were released to the atmosphere during 2009, the potential dose the general population (person-rem) was zero mrem.

5.4 PROTECTION OF BIOTA

Since 1990, DOE Order 5400.5, "Radiation Protection of the Public and the Environment", has required that populations of aquatic organisms be protected using a dose limit of 1 rad/day. While there is no formal DOE dose limit for terrestrial biota, DOE strongly recommends that its site activities meet the internationally recommended dose limits for terrestrial biota, which are:

- the absorbed dose to aquatic animals will not exceed 1 rad/day (10 mGy/day) from exposure to radiation or radioactive material,

- the absorbed dose to terrestrial plants will not exceed 1 rad/day (10 mGy/day) from exposure to radiation or radioactive material, and

- the absorbed dose to terrestrial animals will not exceed 0.1 rad/day (1 mGy/day) from exposure to radiation or radioactive material.

- There is no aquatic system in the Area IV of SSFL. Therefore, the protection of aquatic organisms on-site is not an issue.

The terrestrial biota, i.e., vegetation and small wild animals, are abundant at SSFL. They are subject to exposure to the radioactivity in soil. The DOE Technical Standard, *A Graded Approach for Evaluating Doses to Aquatic and Terrestrial Biota* (DOE, 2002), provides a methodology for demonstrating compliance with the requirement for protection of biota. RESRAD-BIOTA, a computer program developed by DOE, implements the graded approach for biota dose evaluation. There are three levels of dose evaluations in RESRAD-BIOTA. The first level is a conservative screening tool for compliance demonstration. Once the screening test in Level 1 is passed, no further action is necessary.

In the Level 1 dose evaluation, measured radionuclide concentrations in environmental media are compared with the biota concentration guides (BCGs). Each radionuclide-specific BCG represents the limiting concentration in environmental media that would not cause the biota dose limits to be exceeded.

Soil concentrations in Area IV are used for the Level 1 dose evaluation. During the past decades, thousands of soil samples were collected and analyzed, and the results were entered into the RESRAD-BIOTA to compare against the BCGs. Table 5-7, summarizes the comparison results. The total BCG fraction at SSFL, as shown in Table 5-7, is less than 1, indicating that the potential exposure is less than the dose limit recommended by the DOE.

Table 5-7. Terrestrial Biota Radiation Exposure as a Fraction of Dose Limit

Nuclide	Soil		
	BCG Limit pCi/g	On-site Soil Concentration pCi/g	Partial Fraction
Am-241	3.89E+03	2.27E-02	5.83E-06
Cm-242	2.05E+03	5.64E-03	2.75E-06
Cm-244	4.06E+03	2.27E-03	5.59E-07
Co-58	1.80E+03	4.79E-02	2.67E-05
Co-60	6.92E+02	2.85E-02	4.12E-05
Cr-51	5.34E+04	2.51E-01	4.70E-06
Cs-134	1.13E+01	2.37E-02	2.10E-03
Cs-137	2.08E+01	2.24E-01	1.08E-02
Eu-152	1.52E+03	6.73E-02	4.42E-05
Eu-154	1.29E+03	0.00E+00	0.00E+00
Eu-155	1.58E+04	6.33E-02	4.00E-06
H-3	1.74E+05	8.63E+00	4.96E-05
K-40	1.19E+02	1.96E+01	1.65E-01
Pb-210	1.39E+03	1.46E+00	1.05E-03
Po-210	4.33E+03	1.32E+00	3.05E-04
Pu-238	5.27E+03	1.04E-02	1.97E-06
Pu-239	6.11E+03	9.70E-03	1.59E-06
Ra-226	5.06E+01	1.18E+00	2.33E-02
Ra-228	4.39E+01	1.24E+00	2.82E-02
Sr-90	2.25E+01	2.22E-01	9.87E-03
Th-228	5.30E+02	1.26E+00	2.38E-03
Th-230	9.98E+03	1.05E+00	1.05E-04
Th-232	1.51E+03	1.16E+00	7.70E-04
Th-234	2.16E+03	1.11E+00	5.13E-04
U-233	4.83E+03	7.78E-01	1.61E-04
U-234	5.13E+03	8.77E-01	1.71E-04
U-235	2.77E+03	7.54E-02	2.72E-05
U-238	1.58E+03	8.50E-01	5.39E-04
Zn-65	4.13E+02	7.84E-02	1.90E-04
		Sum	**2.46E-01**

6. ENVIRONMENTAL NON-RADIOLOGICAL MONITORING

Boeing SSFL maintains a comprehensive environmental program to ensure compliance with all applicable regulations, to prevent adverse environmental impact, and to restore the quality of the environment from past operations.

The discharge of surface water at SSFL results from storm water runoff or excess treated groundwater. The Los Angeles Regional Water Quality Control Board regulates discharges through a National Pollutant Discharge Elimination System (NPDES) permit. Most surface water runoff drains to the south and is collected in the water reclamation/pond system. Discharges from this system are subject to effluent limitations and monitoring requirements as specified in the NPDES permit. A small portion of the site within Area IV discharges storm water runoff to five northwest runoff channels where sampling locations (Figure 6-1) have been established and sampling is conducted in accordance with the northwest slope monitoring program. All discharges are regularly monitored for various constituents, including: volatile organics, heavy metals, and applicable radionuclides as well as other parameters necessary to assess water quality.

The major groundwater contaminants in Area IV are TCE and its degradation products. Three interim groundwater extraction systems were installed in Area IV between 1994 to 1998. The Building 4059 (B/059) interim system was turned off in 2005 following Building 4059 demolition. The FSDF interim system was shut off in 2003 to facilitate aquifer testing and to support the ongoing CFOU characterization program. The RMHF interim system was deactivated in September 2006. Since all interim groundwater extraction systems have been deactivated, further reporting will therefore be suspended.

The overall annual groundwater monitoring program at SSFL addresses collection and analysis of groundwater samples and measurement of the water levels. The locations of the wells and piezometers within and around DOE areas in Area IV are shown in Figure 6-2. In 2009 shallow wells SRE-NS-E, SRE-NS-N, and SRE-NS-W were reclassified as piezometers and renamed as PZ-160, PZ-161, and PZ-150, respectively. Groundwater quality parameters and sampling frequency have been determined on the basis of historical water quality data, location of known or potential sources of groundwater contamination, operational requirements of groundwater extraction and treatment systems, and regulatory direction. The groundwater monitoring program includes the following parameters, which are analyzed using the appropriate EPA methods: volatile organic constituents, base/neutral and acid extractable organic compounds, petroleum hydrocarbons, trace metals, and common ion constituents. Radiological analyses are performed on groundwater samples from DOE areas in Area IV and off-site (see section 5.2.2).

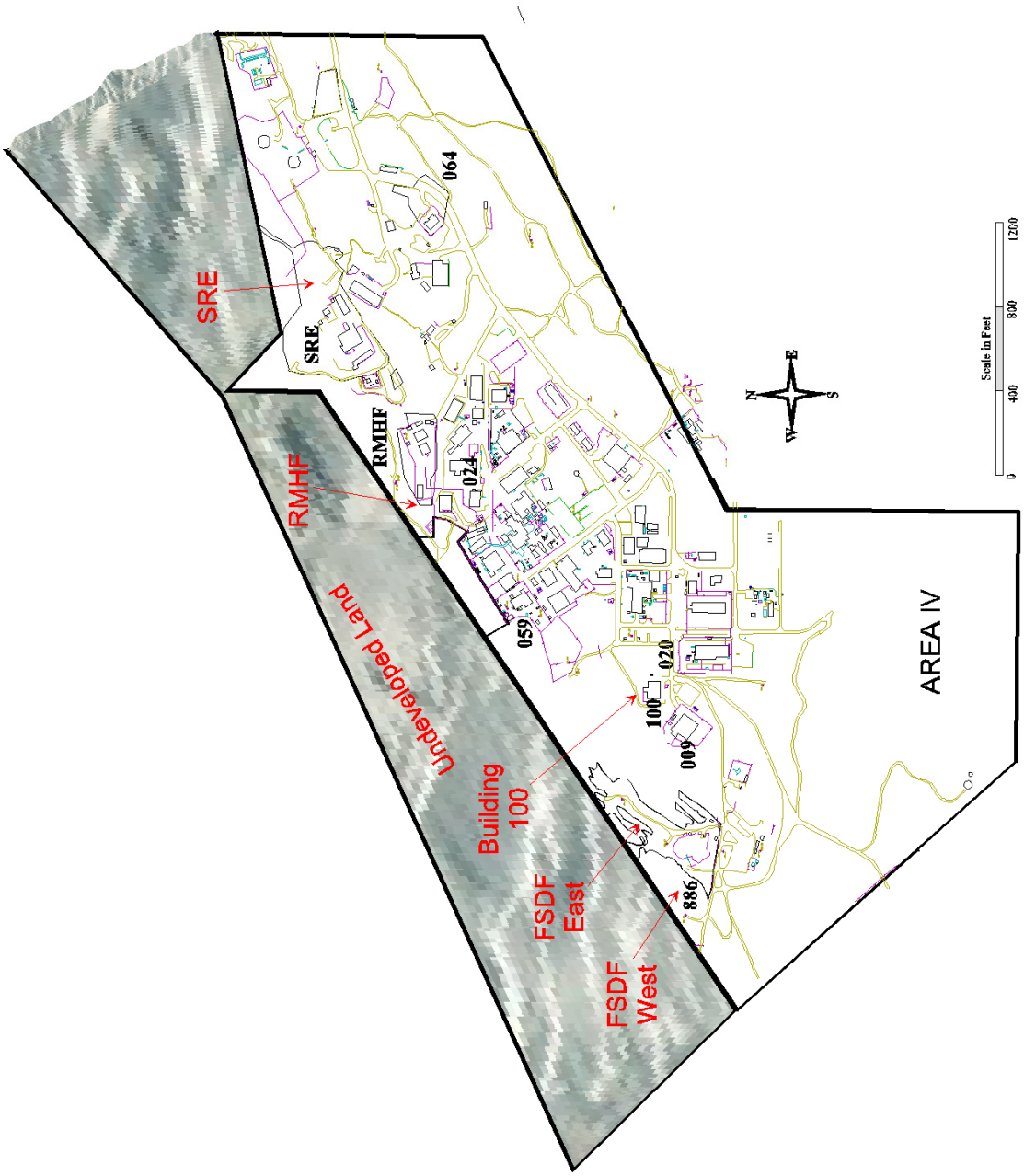

Figure 6-1. Locations of Surface Water Runoff Collectors

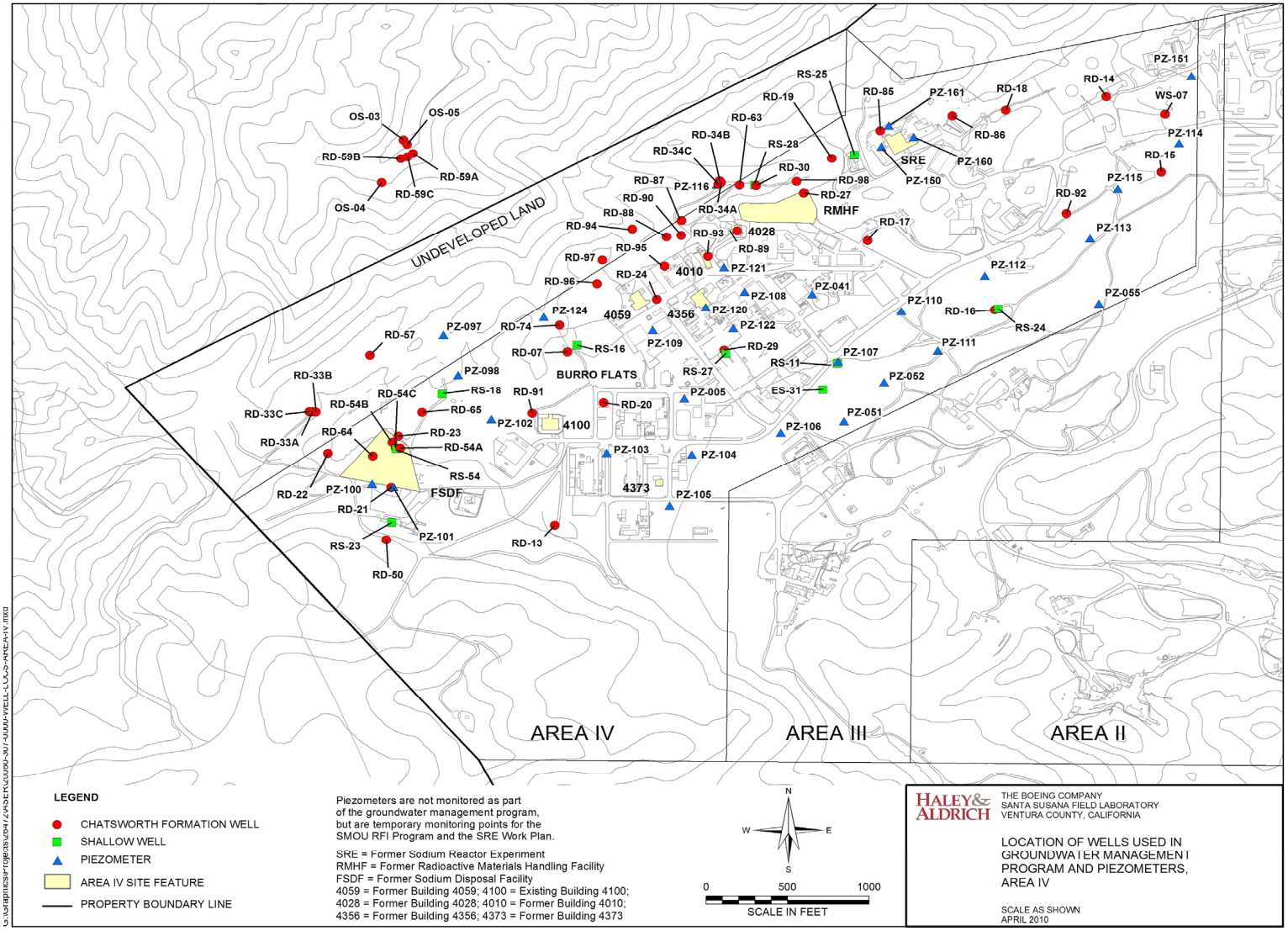

Figure 6-2. Well and Piezometer Locations

6.1 SURFACE WATER

The Los Angeles Regional Water Quality Control Board (LA RWQCB) has granted Boeing SSFL a discharge permit pursuant to the National Pollutant Discharge Elimination System and Section 402 of the federal Water Pollution Control Act. The permit to discharge, NPDES No. CA0001309, initially became effective on September 27, 1976, and was most recently renewed on May 19, 2009 and became effective on June 29, 2009.

The permit allows the discharge of storm water runoff from retention ponds into Bell Creek, a tributary of the Los Angeles River. Storm water from the southeastern portion of Area I is permitted to discharge to Dayton Creek and from the Northeastern locations of Area II into the Arroyo Simi, a tributary of Calleguas Creek. The permit also allows for the discharge of storm water runoff from the northwest slope (Area IV) locations into the Arroyo Simi, a tributary of Calleguas Creek. Discharge along the northwest slope (RMHF: Outfall 003, SRE: Outfall 004, FSDF #1: Outfall 005, FSDF #2: Outfall 006, and T100: Outfall 007) generally occurs only during and immediately after periods of heavy rainfall. The permit applies the numerical limits for radioactivity established for drinking water supplies to discharges through these outfalls. As of March 8, 2006 all rocket engine testing has ceased. No waste water currently generated from site operations is discharged. Discharges consist only of treated groundwater, storm water runoff and fire suppression water.

There is no sanitary sewer connection to a publicly owned treatment works from SSFL. Domestic sewage is temporarily stored in three inactive Sewage Treatment Plants (STP) and then trucked offsite for treatment and disposal, as summarized in the monthly Discharge Monitoring Reports (DMR) reports to the RWQCB. Boeing SSFL does not anticipate future use of any of the STPs. Area IV sewage is piped directly to the Area III Sewage Treatment Plant (STP III).

Of the two retention ponds at SSFL that discharge via the NPDES permit, only one, the R-2A Pond, receives influent from Area IV. Influent to the pond is from storm water runoff only. When there is discharge from either the Perimeter or R-2 ponds grab and composite samples are collected and sent to a California State certified testing laboratory for analysis. Analyses include chemical constituents such as heavy metals, volatile organics, base/neutral and acid extractables, general chemistry, and specified radionuclides. Toxicity testing is also conducted in the form of acute and chronic toxicity bioassays.

In November 1989, a storm water runoff-monitoring program was developed and implemented in Area IV for runoff from the northwest portion of the site. The five monitoring locations selected include: the Radioactive Materials Handling Facility watershed (Outfall 003), Sodium Reactor Experiment watershed (Outfall 004), the Former Sodium Disposal Facility watershed (Outfalls 005 and 006), and the Building T100 watershed (Outfall 007). Runoff monitoring is currently conducted as set forth by the NPDES permit referenced above. Furthermore, all surface water program activities for the SSFL, including Area IV, have been addressed and incorporated into the current NPDES permit. A Storm Water Pollution Prevention Plan was prepared in accordance with the current federal and state regulations.

Details on the NPDES discharge from the SSFL for the period of January 1, 2009 through December 31, 2009 are available in 2009 Annual NPDES Discharge Monitoring Report (Boeing, 2009). This annual report provides information and data, including summary tables of surface water sample analytical results, rainfall summaries, liquid waste shipment summaries, and analytical laboratory QA/QC procedures and certifications. The report may also be viewed at:
http://www.boeing.com/aboutus/environment/santa_susana/ents/monitoring_reports.html

6.2 AIR

The SSFL is regulated by the VCAPCD and must comply with all applicable rules, regulations, and permit conditions set forth in the air permit. During the 2008, the former Permit to Operate No.00271 for DOE was consolidated into SSFL Permit to Operate No. 00232. As a result, the current Permit is No. 00232. No changes or modifications from the previous permit were made as a result of the permit consolidation, however, as equipment has been removed from the site, it is taken off the permit. Permit to Operate No.00232 covers all areas of the SSFL, which is inspected annually by VCAPCD. On March 25, 2009, the annual inspection was performed. No issues or violations were identified. Likewise, air emissions associated with this operating permit have continued to remain under the threshold limits contained the permit conditions. This area is not considered a major source and therefore is not captured under Title-V or the Aerospace NESHAP. Area IV, as well as the entire SSFL, does not meet the reporting threshold under SARA 313 Toxic Release Inventory Reporting.

6.3 GROUNDWATER

A groundwater monitoring program has been in place at the SSFL site since 1984. Currently, the monitoring system includes 264 Boeing SSFL installed on-site and off-site wells and 20 private off-site wells. An additional 163 piezometers are installed on- and off-site. Routine quarterly chemical and radiological monitoring of the wells is conducted according to the monitoring plan submitted to DTSC for the groundwater program. Quarterly reports are submitted to the regulatory agencies at the end of the first three quarters. An annual report is submitted to the lead agencies after the monitoring for the fourth quarter is completed. A summary of groundwater monitoring activities and sampling results for Area IV during 2009 is presented in Tables 6-1 and 6-2.

Table 6-1. Groundwater Monitoring at Area IV in 2009

Item	Remediation	Waste Management	Environmental Surveillance	Other Drivers
Number of active wells monitored	0	0	45	0
Number of samples taken	0	0	204	0
Number of analyses performed	0	0	887	0
% of analyses that are nondetect	NA	NA	87	NA

Table 6-2. Ranges of Detected Non-Radiological Analytes in 2009 Groundwater Samples

Analytes	Ranges of Results for Positive Detections
Bromide (mg/L)	0.19 J to 1
Chloride (mg/L)	27.8 to 190
Cyanides (mg/L)	0.0053 J
Dioxins and Furans (pg/L)	2 J to 5.7 J
Fluoride (mg/L)	0.36 J to 1
Metals (mg/L)	0.000023 J to 26.7
Diesel Range Organics (mg/L)	3.4 to 19 J
Nitrate-NO3 (mg/L)	1.6 J to 58
pH	7 to 7.4
Sulfate (mg/L)	78 to 140
Hydrazines (µg/L)	0.648 J
1,1,2-Trichloro-1,2,2-trifluoroethane (µg/L)	1.7 to 3.8
1,1-Dichloroethane (µg/L)	0.2 J to 4 J
1,1-Dichloroethene (µg/L)	0.1 J to 23
1,2-Dichloroethane (µg/L)	0.6 J
cis-1,2-Dichloroethene (cis-1,2-DCE) (µg/L)	0.3 J to 350
Methyl ethyl ketone (µg/L)	1.2 J
Trichloroethene (TCE) (µg/L)	0.1 J to 630
Tetrachloroethene (PCE) (µg/L)	0.5 to 0.5
Other Volatile Organic Compounds (µg/L)	0.1 J to 67

J = Estimated value. Analyte detected at a level less than the reporting limit and greater than or equal to the MDL.

Groundwater occurs at SSFL in the alluvium, weathered bedrock, and unweathered bedrock. First-encountered groundwater may be observed in any of these media under water table conditions. For the purposes of this report, "near-surface groundwater" is defined as groundwater that is present in the alluvium and weathered bedrock, and groundwater that occurs in the unweathered bedrock is referred to as "Chatsworth Formation groundwater". The alluvium is indicated to generally consist of unconsolidated sand, silt, and clay. Some portions of the alluvium and upper weathered Chatsworth Formation are saturated only during and immediately following a wet season. Within Area IV, there are 10 DOE-sponsored near-surface groundwater wells, 28 DOE-sponsored near-surface groundwater piezometers, three Boeing-sponsored near-surface groundwater piezometers, and one NASA-sponsored near-surface groundwater piezometer (Figure 6-2). The principal water bearing system at the Facility is the fractured Chatsworth Formation, predominantly composed of weak- to well-cemented sandstone with interbeds of siltstone and claystone. Several hydraulically significant features such as fault zones and shale beds are present at SSFL and may act as aquitards or otherwise influence the groundwater flow system. There are 49 DOE-sponsored Chatsworth Formation wells and 3 private off-site wells in and around Area IV (Figure 6-2).

The solvents found in Area IV groundwater include trichloroethene (TCE) and its family of degradation products. The results of the 2009 analyses of the Area IV wells were documented in the 2009 Annual Groundwater Monitoring Report (HA, 2010). Boeing initiated a voluntary site-wide program to assess the occurrence and distribution of perchlorate in 1997. This assessment identified a limited area of groundwater in the vicinity of the FSDF that has been impacted by perchlorate. Historical perchlorate concentrations in FSDF-area groundwater ranged from an estimated 1.6 µg/L (RD-65) to 56 µg/L (RD-54A).

Six distinct areas of TCE-impacted groundwater have been delineated in the northwest part of Area IV. These areas include the drainage below RMHF, the vicinity of former Building 4059, the FSDF area, the former Building 4028 area, the Building 4100 area, and the Sodium Reactor Experiment (SRE) area (Figure 6-3). These areas are roughly defined by the locations of monitor wells where results of laboratory analyses of water samples collected in 2009 or past years indicate concentrations of TCE equal to or above the MCL of 5 µg/L.

RMHF: The TCE occurrence associated with the RMHF canyon (the northern occurrence) has historically been detected in shallow wells and Chatsworth Formation wells. TCE was not detected in the groundwater samples collected from shallow wells in 2009. In 2009, maximum TCE concentrations exceeded the MCL at two Chatsworth Formation wells: RD-63 (11 µg/L) and RD-98 (10 µg/L). RD-63 was installed in 1994 in the Chatsworth Formation for the pilot extraction test in the area. TCE was detected below the MCL in the groundwater samples collected from wells RD-17 (0.8 µg/L), RD-34A (4.6 µg/L) and RD-34B (0.4 J µg/L) during 2009. Each of these concentrations was less than the historical maximum TCE concentration for its respective location.

Former Building 4059: TCE was detected in groundwater collected from one well located near former Building 4059 during the year. TCE was detected in well RD-07 at concentrations ranging from 16 to 25 µg/L. The RD-07 samples were collected from a discrete interval groundwater monitoring system installed in April 2002. Since its construction in 1986, RD-07 generally contained TCE concentrations in the 1.5 to 81 µg/L range with a maximum TCE concentration of 130 µg/L.

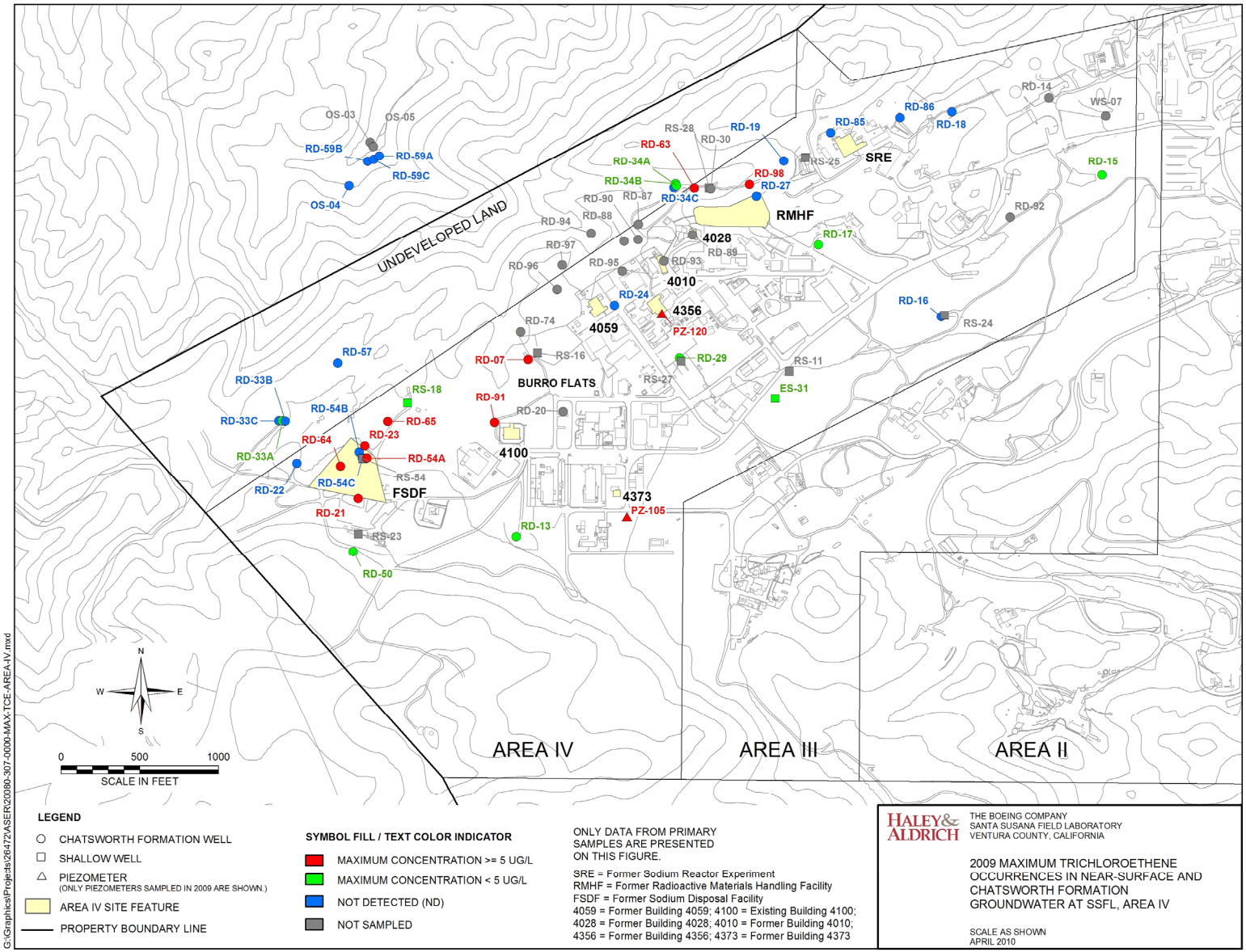

Figure 6-3. TCE Occurrences in Groundwater at SSFL, Area IV

FSDF: TCE was detected in groundwater collected from wells located near the FSDF area during the year. Chatsworth Formation wells containing maximum TCE concentrations exceeding the MCL included RD-21 (340 µg/L), RD-23 (630 µg/L), RD-54A (15 µg/L), RD-64 (110 µg/L), and RD-65 (110 µg/L). TCE was detected at a new maximum concentration in groundwater collected from well RD-23. In previous samples from RD-23, the maximum TCE concentration was 610 µg/L. TCE was detected below the MCL in groundwater collected at wells RD-33A and RD-50 at estimated concentrations ranging up to 0.2 µg/L. Historical TCE concentrations in RD-33A and RD-50 have ranged from an estimated 0.1 to 14 µg/L and an estimated 0.1 to 4.7 µg/L, respectively. TCE was detected below the MCL in groundwater collected at shallow well RS-18 at a concentration of 2 µg/L. This concentration was less than the historical maximum TCE concentration.

Former 4028: No TCE samples were collected from this area in 2009.

Building 4100: TCE was detected in groundwater collected from one well located near Building 4100 during the year. TCE was detected in well RD-91 at concentrations ranging from 260 to 280 µg/L. TCE was detected at a new maximum concentration in groundwater collected from well RD-91. In previous samples from RD-91, the maximum TCE concentration was 130 µg/L.

SRE: TCE was not detected in groundwater samples collected from wells located in this area in 2009.

Other areas: TCE was detected in several wells outside of the six concentrated areas of TCE-impacted groundwater. Shallow piezometers containing TCE concentrations exceeding the MCL included PZ-105 which is located in the central part of Area IV south of former Building 4373 and PZ-120 which is located south of former Building 4356. PZ-105 and PZ-120 contained TCE concentrations ranging up to 11 and 53 µg/L, respectively. Historical TCE concentrations in PZ-105 have ranged from an estimated 3 to 12 µg/L. Historical TCE concentrations in PZ-120 have ranged from non-detected at the method detection limit of 5 to 31 µg/L. TCE was detected below the MCL in groundwater collected at Chatsworth Formation wells RD-13, RD-15, RD-29, and shallow well ES-31 which are located in the central part of Area IV near Burro Flats. Occurrence of TCE in RD-13 was determined to be the result of improperly decontaminated sampling equipment temporarily installed during the fourth quarter of 2000. TCE concentrations in RD-13 groundwater ranged from non-detected at 0.25 to an estimated 0.3 µg/L in 2009. RD-15, RD-29, and ES-31 contained TCE concentrations of an estimated 0.1 µg/L, 2.2 µg/L, and an estimated 0.3 µg/L, respectively. These results were within historical detection ranges of 0.2 to 1 µg/L in RD-15, of an estimated 0.47 to 3.1 µg/L in RD-29, and an estimated 0.2 µg/L to an estimated 0.67 µg/L in ES-31.

The extraction activity at the FSDF occurred between 1995 and 2003. The groundwater extraction system at FSDF included extraction of impacted groundwater from wells RD-21 and RS-54 and treatment of the extracted groundwater in a GAC adsorption treatment unit. The FSDF system also used ion exchange resin in series to treat perchlorate-impacted groundwater prior to discharge. Groundwater has not been extracted from FSDF interim extraction wells RS-54 and RD-21 since 2003 in order to accommodate FSDF-area groundwater investigations.

In addition to groundwater monitoring activities, additional characterization efforts have been conducted in the FSDF area of Area IV. During 2009, discrete interval groundwater monitoring systems installed in nine FSDF-area wells were sampled for diesel range organics, dioxins and furans, cyanide, radionuclides, filtered (dissolved solids) trace metals, and VOCs. The data loggers monitored discrete-interval water level fluctuations, produced discrete-interval hydraulic head readings within the Chatsworth Formation groundwater system, and allowed the collection of discrete fracture connectivity testing data. Transducer data loggers installed in nine FSDF-area groundwater wells collected continuous water level data that supplemented discrete interval monitoring data.

The 2009 Annual Groundwater Monitoring Report may be found at:
http://www.etec.energy.gov/Cleanup/Groundwater_Monitoring.html

6.4 SOIL

Potential chemically contaminated soils are being addressed through the RCRA Facility Investigation (RFI) at the SSFL. The primary objectives of this investigation are (1) to investigate the nature and extent of chemicals in soil and the potential threat to groundwater quality for each of the SWMUs and AOCs identified for potential RFI Corrective Action, and (2) to evaluate the potential risk to human health and the environment presented by these SWMUs and AOCs to assess whether remediation is required. The data from the investigation will be evaluated following DTSC-approved risk assessment methodologies to determine whether remediation, additional assessment, or no further action is necessary to bring each site to closure.

The RFI Program started at the SSFL site in 1996 and is presently ongoing. Current RFI fieldwork is limited primarily focusing on sampling needed for reporting, and is currently scheduled to be completed in 2012 for RFI groups within Area IV. Field methodologies for the soil investigation include soil matrix sampling, soil vapor sampling, surface water sampling, and trenching. DTSC was onsite during much of the fieldwork to observe sampling protocols and select sampling locations and depths. Risk-based screening levels (RBSL) were developed prior to sampling in conjunction with DTSC risk assessors for use as soil screening values during the field program, and have been updated to reflect revised risk assessment requirements for the SSFL. The RBSLs are calculated to be chemical concentrations in soil that would not pose a threat to human health or ecological receptors.

Limited RFI fieldwork was completed in 2009 at DOE RFI sites. During 2009, 14 soil matrix, 55 near-surface groundwater, and 21 spring/seep samples were collected in areas within and near DOE RFI sites. Data review and validation for these samples have been completed. Samples collected and analyses performed to date at DOE locations are summarized in Table 6-3.

Table 6-3. Sampling for RCRA Facility Investigation

Date	Soil Matrix		Soil Vapor		Surface Water		Groundwater		Spring/Seep	
	Sample	Analysis	Sample	Analysis	Sample	Analysis	Sample	Analysis	Sample	Analysis
1/1/09 to 12/31/09	14	74	0	0	0	0	55	155	21	30
Total to date	1,485	4,808	357	357	18	36	122	342	41	91

Key activities completed in the year 2009 included the following:

Soil matrix, soil vapor, and groundwater sampling was conducted at the Building 4133 Hazardous Waste Management Facility (B4133) (SWMU 7.2) and the Radioactive Materials Handling Facility (RMHF) (SWMU 7.6 and Area IV AOC) RFI sites in support of the preparation of the Group 7 RFI Report. Onsite debris/trash removal from portions of SSFL Area IV was conducted.

In 2009, work was completed on the Group 7 RFI Report, and the report was submitted to the DTSC in June. Conditional approval for the Group 6 Sampling and Analysis Plan (SAP) was received from DTSC and field preparations began. Comments were received from DTSC on the Group 8 RFI report that was submitted in 2007, and work began on the response to comments and preparation of a SAP. The Chemical Soil Background Study Work Plan was prepared and submitted to DTSC in 2009. Work began on revising the risk assessment procedures of the existing Standardized Risk Assessment Methodology (SRAM) Revision 3 through submission of a series of technical memoranda that document updates to process/methodology, toxicity reference values, bioaccumulation factors, and risk-based screening levels. A work plan for evaluation of potential offsite debris areas was prepared and submitted to DTSC.

Work planned for 2010 includes preparation of a response to DTSC comments on the Groups 5 and 7 RFI Reports, and preparation of individual SAPs to address DTSC comments on those reports. Additionally, implementation of the Group 6 SAP to address DTSC comments will be performed, and a response to DTSC comments on the RFI report and a SAP will be prepared for Group 8. Revisions to the risk assessment procedures will continue. Additional detail on RFI soil sampling may be found at:

http://www.boeing.com/aboutus/environment/santa_susana/groundwater_soil.html

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7. ENVIRONMENTAL MONITORING PROGRAM QUALITY CONTROL

This section describes the quality assurance (QA) elements incorporated into the Boeing SSFL radiological monitoring program. The following elements of quality control are used for the Boeing SSFL program:

- Reagent Quality—Certified grade counting gas is used.
- Laboratory Ventilation—Room air supply is controlled to minimize temperature variance and dust incursion.
- Laboratory Contamination—Periodic laboratory contamination surveys for fixed and removable surface contaminations are performed. Areas are cleaned routinely and decontaminated when necessary.
- Control Charts—Background and reference source control charts for counting equipment are maintained to evaluate stability and response characteristics.
- Laboratory Intercomparisons—Contract analytical labs participate in the DOE MAPEP.
- Calibration Standards—Counting standard radioactivity values are traceable to NIST primary standards.
- Co-location of State DPH thermoluminescent dosimeters.

7.1 PROCEDURES

Procedures followed include those for selection, collection, packaging, shipping, and handling of samples for off-site analysis; sample preparation and analysis; the use of radioactive reference standards; calibration methods, and instrument QA; and data evaluation and reporting.

7.2 RECORDS

Records generally cover the following processes: field sample collection and laboratory identification coding; sample preparation method; radioactivity measurement (counting) of samples, instrument backgrounds, and analytical blanks; and data reduction and verification.

Quality control records for laboratory counting systems include the results of measurements of radioactive check sources, calibration sources, backgrounds, and blanks as well as a complete record of all maintenance and service.

Records relating to overall laboratory performance include the results of analysis of inter-laboratory cross-check samples and other quality control analyses; use of standard (radioactive) reference sources; and calibration of analytical balances.

7.3 QUALITY ASSURANCE

Boeing SSFL uses several commercial labs for radiochemical analysis. These contract labs participated in the DOE Mixed Analyte Performance Evaluation Program (MAPEP). The MAPEP program is operated by the DOE's Radiological and Environmental Sciences Laboratory (RESL). The comparison study Series 20 and 21 were conducted in 2009, and the contract labs participated the studies for air, soil and water samples.

Acceptance criteria was developed by reviewing precision and accuracy data compiled from other performance evaluation programs, analytical methods literatures, the MAPEP pilot studies, and what is considered reasonable, acceptable, and achievable for routine analyses among the more experienced laboratories. The acceptance criteria are designed to be pragmatic in approach and may be changed as warranted.

For each reported radiological and inorganic analyte, the laboratory result and the RESL reference value will be used to calculate a relative bias:

$$\%\,\text{BIAS} = \frac{(100)(\text{Labortory Result} - \text{RESL Reference Value})}{\text{RESL Reference Value}}$$

For each reported organic analyte, the laboratory result, the mean of all reported results and the standard deviation of all results (less outliers) will be used to calculate a Z-score:

$$Z\text{-Score} = \frac{(100)(\text{Laboratory Result - Mean of All Data})}{\text{Standard Deviation of All Data}}$$

The relative bias will place the laboratory result in one of three categories:
1) ACCEPTABLE..... BIAS <= 20%
2) ACCEPTABLE WITH WARNING…. 20% < BIAS <= 30%
3) NOT ACCEPTABLE..... BIAS > 30%

The Z-Score will place the laboratory result in one of three categories:
1) ACCEPTABLE..... Z-Score <= 2.0
2) ACCEPTABLE WITH WARNING…. 2.0 < Z-Score <= 3.0
3) NOT ACCEPTABLE..... Z-Score > 3.0

The reported uncertainty is not currently used as part of the acceptance criteria, but it will be used to flag a potential area of concern. Activity levels and other analyte concentrations for MAPEP samples are typically sufficient to permit analyses with uncertainties of 10% or less, but it is unreasonable to expect the uncertainty for a single analysis of a routine sample to be much lower than the 10% value.

Variations in counting efficiencies, chemical yields, analytical methods, sample size, count times, difficult analyses, etc., will likely cause some uncertainties to exceed the 10% value. A meaningful routine analysis, however, will not over inflate the uncertainty estimate. The MAPEP will provide some feedback to the participants regarding the uncertainties reported with their results. Reported uncertainties that appear unreasonably low or suspiciously high will be flagged. Participants with flagged uncertainties, particularly if they are numerous, should review their methods and ensure that the uncertainties are appropriate.

The analytical labs that were involved in analyzing environmental samples for this report included: Eberline Services in Richmond, CA, GEL Laboratories in Charleston, SC, TestAmerica in Richland, WA, and TestAmerica in St. Louis, MO. Their performance results in the 2009 study are summarized in Figure 7-1 and 7-2.

In addition to the MAPEP comparison study, representatives from Boeing and its contractors periodically conduct on-site audits at these commercial laboratories to ensure the quality of the sample analysis.

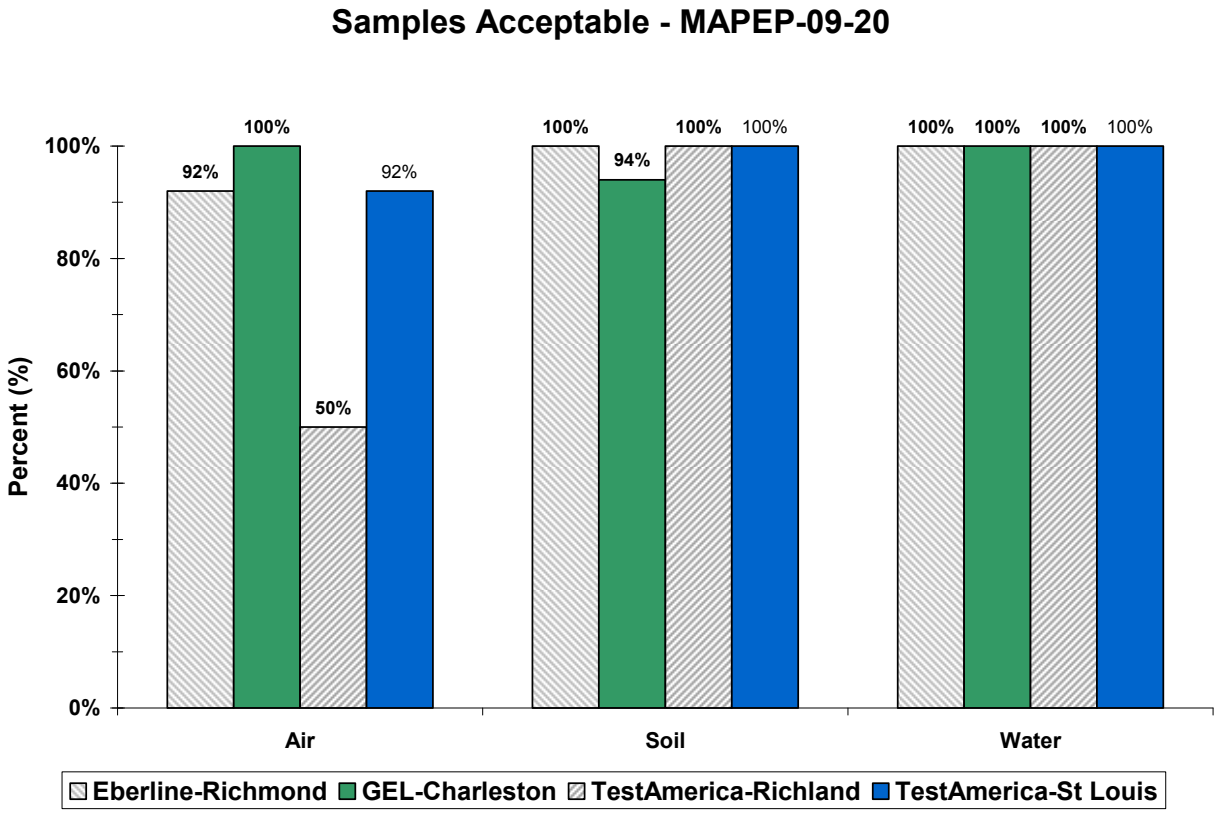

Figure 7-1. Mixed Analyte Performance Evaluation, Series 20, 2009

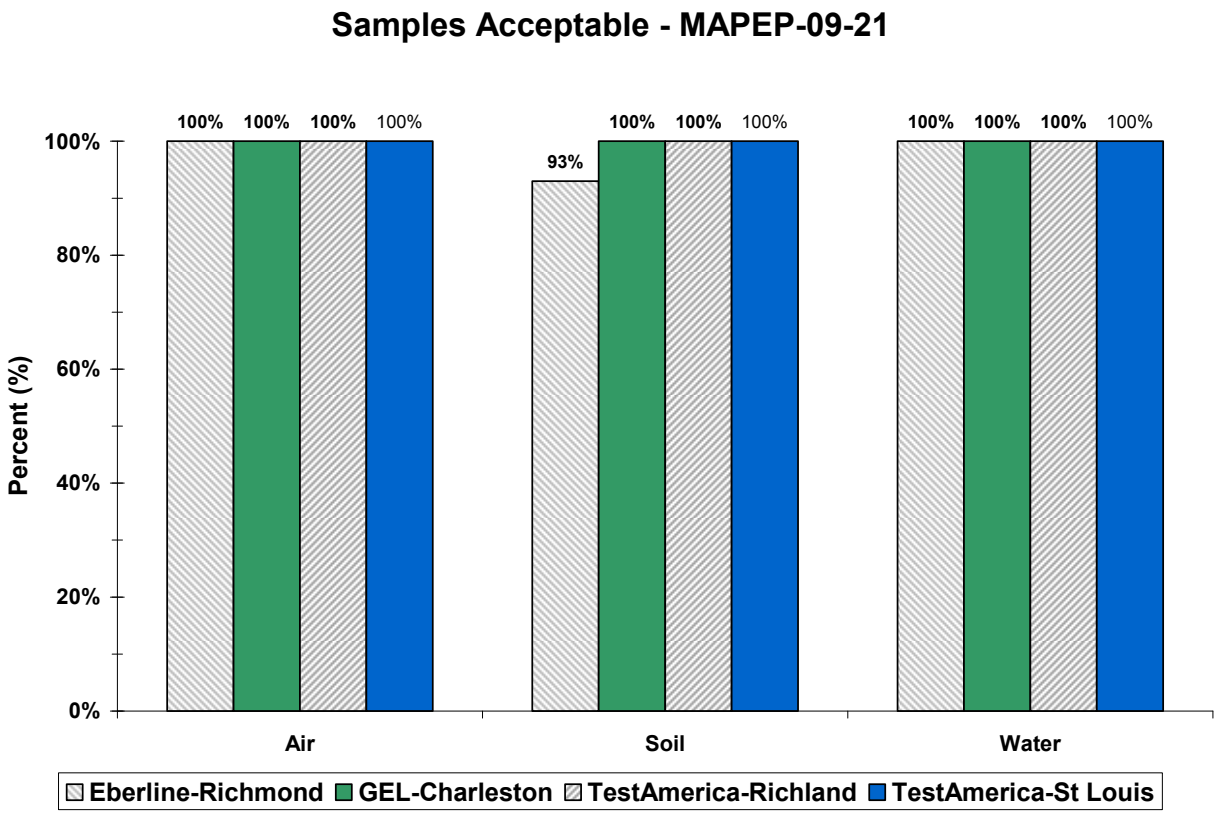

Figure 7-2. Mixed Analyte Performance Evaluation, Series 21, 2009

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APPENDIX A
ACRONYMS

AI	Atomics International
ALARA	As Low As Reasonably Achievable
ASER	Annual Site Environmental Report
ANL	Argonne National Laboratory
ASL	Above Sea Level
ATSDR	Agency for Toxic Substances and Disease Registry
BCG	Biota Concentration Guides
CAA	Clean Air Act
CAL/OSHA	California Occupational Safety and Health Administration
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CWA	Clean Water Act
D&D	Decontamination and Decommissioning
DCG	Derived Concentration Guideline
DCGL	Derived Concentration Guideline Level
DPH/RHB	Department of Public Health/Radiologic Health Branch
DMR	Discharge Monitoring Report
DOD	Department of Defense
DOE	Department of Energy
DTSC	Cal-EPA Department of Toxic Substances Control
EA	Environmental Assessment
EEOICPA	Energy Employees Occupational Illness Compensation Program Act
EHS	Environment, Health and Safety
EIS	Environmental Impact Statement
EML	Environmental Measurements Laboratory
EP	Environmental Protection
EPA	Environmental Protection Agency

ER	Environmental Remediation
ETEC	Energy Technology Engineering Center
FFCAct	Federal Facilities Compliance Act
FONSI	Finding of No Significant Impact
FSDF	Former Sodium Disposal Facility
GRC	Groundwater Resources Consultants, Inc. (Tucson, AZ)
HEPA	High-Efficiency Particulate Air
HPGe	High-Purity Germanium (Detector)
HWMF	Hazardous Waste Management Facility
ISMS	Integrated Safety Management System
LARWQCB	Los Angeles Regional Water Quality Control Board
LLNL	Lawrence Livermore National Laboratory
LLW	Low Level Waste
MAPEP	Mixed Analyte Performance Evaluation Program
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MCA	Multichannel Analyzer
MCL	Maximum Contamination Level
MDA	Minimum Detectable Activity
MEI	Maximally Exposed Individual
MLLW	Mixed Low-level Waste
NASA	National Aeronautics and Space Administration
ND	Not Detected
NEPA	National Environmental Policy Act
NESHAPs	National Emission Standards for Hazardous Air Pollutants
NIST	National Institute of Standards and Technology
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
NSPS	New Source Performance Standards
ORAU	Oak Ridge Associated Universities
ORISE	Oak Ridge Institute for Science and Education
ORPS	Occurrence Reporting and Processing System

PCB	Polychlorinated Piphenyl
PCE	Perchloroethene
PEIS	Programmatic Environmental Impact Statement
QA	Quality Assurance
QAP	Quality Assessment Program
R&D	Research and Development
RCRA	Resource Conservation and Recovery Act
RESL	Radiological and Environmental Sciences Laboratory
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RFP	Request for Proposal
RMHF	Radioactive Materials Handling Facility
ROD	Record of Decision
RS	Radiation Safety
RWQCB	Regional Water Quality Control Board
SARA	Superfund Amendments and Reauthorization Act
SIPs	State Implementation Plans
S&M	Surveillance and Maintenance
SNAP	Systems for Nuclear Auxiliary Power
SPCC	Spill Prevention Control and Countermeasure
SPTF	Sodium Pump Test Facility
SRAM	Standardized Risk Assessment Methodology
SRE	Sodium Reactor Experiment
SSFL	Santa Susana Field Laboratory
SWPPP	Storm Water Pollution Prevention Plan
STP	Sewage Treatment Plant or Site Treatment Plan
SWMU	Solid Waste Management Unit
TCE	Trichloroethylene
TEDE	Total Effective Dose Equivalent
TLD	Thermoluminescent Dosimeter
TRU	Transuranic

UST	Underground Storage Tank
VCAPCD	Ventura County Air Pollution Control District
WVN	Water Vapor Nitrogen

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Site Environmental Report Reader Survey--2009

To Our Readers:

The Annual Site Environmental Report publishes the results of environmental monitoring in support of DOE-sponsored programs at Boeing's Santa Susana Field Laboratory, and documents our compliance with federal, state, and local environmental regulations. In providing this information, our goal is to give our readership—regulators, scientists, and the public—a clear understanding of our environmental activities, the methods we use, how we can be sure our results are accurate, the status of our programs, and significant issues affecting our programs.

It is important that the information we provide is easily understood, of interest, and communicates Boeing's efforts to protect human health and minimize our impact on the environment. We would like to know from you whether we are successful in achieving these goals. Your comments are appreciated and will help us to improve our communications.

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